Test Report issued under the responsibility of:

LYNS-TCi

TEST REPORT

DIN VDE V 0124-100

Test requirements for generation units to be connected and operated parallel with the low voltage distribution networks

Report Number.	**LS2A25112702EGDE01**
Total pages	248
Tested by (name + signature)	Biscuit Ren / Test engineer
Approved by (name + signature)	Lukes Lin / Project Manager
Date of issue	2026-04-12

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Manufacturer	Same as Applicant
Address	Same as Applicant

Testing laboratory name	Lyns-tci Technology Guangdong Co., Ltd.
Address	Room 1201, Unit 2, Building 18, No. 7, Science and Technology Boulevard, Houjie Town, Dongguan City, Guangdong, 523960 P.R.C
Testing Location	As above
Address	As above

Test specification:

Standard	VDE AR-N 4105:2018-11 DIN VDE V 0124-100:2020-06
Test Report Form No.	VDE0124-100 VER.1.1

Issued by: Lyns-tci Technology Guangdong Co., Ltd.
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Product name .....:	$P_{AV,E}$ -Control System which consists of: • power monitoring unit • Current Transformer • power generating unit

	Device details					
	Control Unit	Brand: CONOW, Model: **SDM01**				
	Power Monitoring Unit	Brand: CONOW, Model: **SDM01**				
	Current transformer (if any)					
	Voltage transformer (if any)	N/A				
(1)	Inverter used for testing	Brand: CONOW, Model: **CME06-2BM250**				
(2)	Location of measuring signal for power flow control	☒	Point of interconnection	☐	Load	

Power monitoring unit		
Type of product ..... :	Single-Phase Meter	
Manufacturer ..... :	Shanghai Bituo Electric Co.,Ltd	
Trademark ..... :	N/A	
Technical data ..... :	Model:	**SDM01**
	Rating voltage:	L/N, 220~240V, 50/60Hz
	Max. input current:	83,3mA
	Energy measurement accuracy:	1%
	Maximum power consumption:	≤2VA
	Communication :	RS485/WiFi
	Hardware Version:	V1.0.0
	Software Version:	V1.0.9
	SN:	M1125180047

Current Transformer	
Type of product ..... :	Spit-core Current Transformers
Max. current..... :	120A
Accuracy..... :	1%

Power generating unit	
Product name .....:	Energy Storage System
Trade Mark .....:	conow
Factory's name 1 .....:	PYS High-Tech Co.,Ltd
Factory address 1 .....:	(1F-12F)101-1201, Block 9, Lianhua Industrial Zone, Longhua Longyuan Road,518109, Hualian Community, Longhua Street, Longhua District,Shenzhen City,Guangdong Province, P. R. China

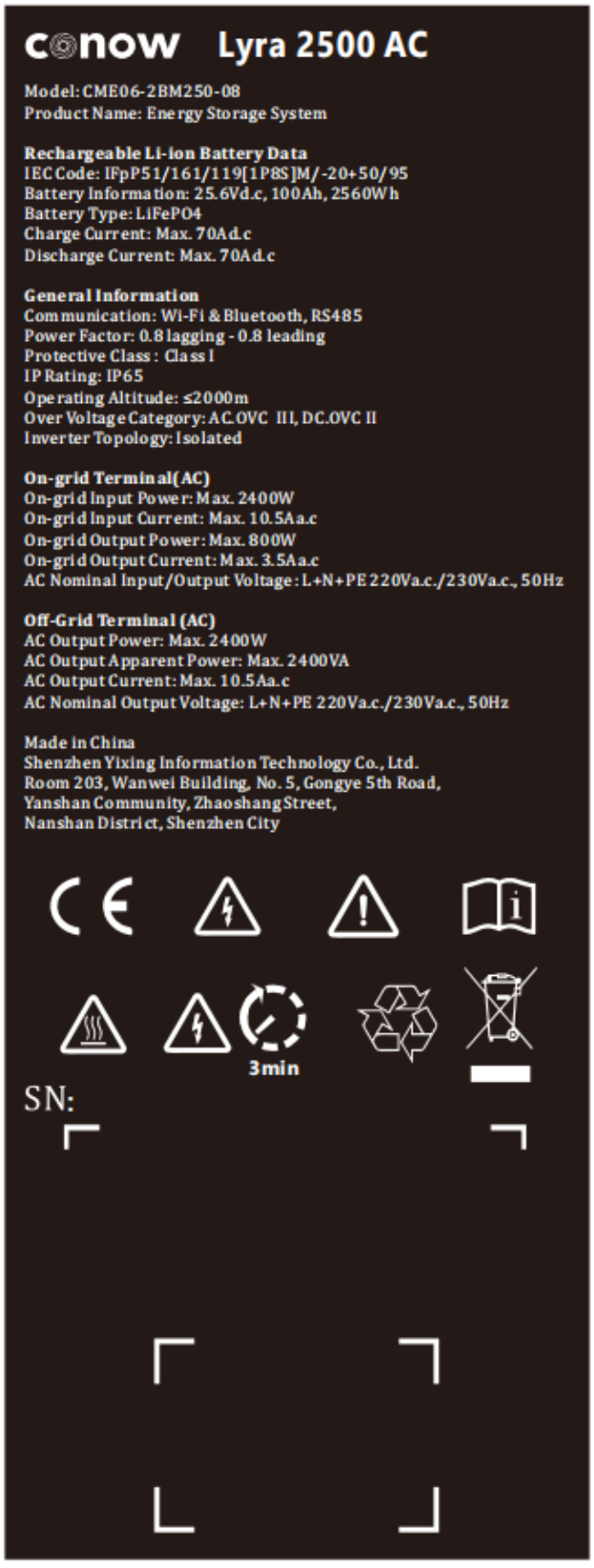
Factory's name 2 .....: Factory address 2 .....:	GUANGDONG UNIONMAN NEW ENERGY CO., LTD. No.9 Qitai Road, Huinan Hi-Tech Industrial Park, Huizhou City, Guangdong Province, China	
Factory's name 3 .....: Factory address 3 .....:	Huizhou Ten Pao Chuangneng Technology Co., Ltd. No.8, Qingli 3rd Road, Shuikou Street, Huicheng District,Huizhou City, Guangdong Province, 516005, P.R.China	
Model .....:	**CME06-2BM250**	**CME06-2BM250-08**
Ratings:		
Battery Date		
Battery Type .....:	LiFePO4	
Battery information .....:	25,6 V, 100 Ah, 2560Wh	
Life Cycle (Times) .....:	> 6000 (25°C)	
Firmware version of the BMS .....:	V1.0.2	
Standard Charge/Discharge Current:	50A/50A	
Max. Charge/Discharge Current:	70A/70A	
AC Input / Output (On-Grid)		
AC Nominal Output Voltage .....:	220V / 230V, L+N+PE, 50 Hz **	
Max. Output Power.....:	1500W	800W
Max. Output Current.....:	6,6A	3,5A
Max. Input Current.....:	10,5A	
Max. Input Power .....:	2400W	
Bypass (AC)		
AC Nominal Output Voltage .....:	220V / 230V, L+N+PE, 50 Hz **	
Rated Output Power.....:	2400W	
Max. Output Current.....:	10,5A	
Rated Output Current.....:	10,5A	
Software version.....:	V1.01.02	
Note: * All tests are performed at 230V, 50Hz.		

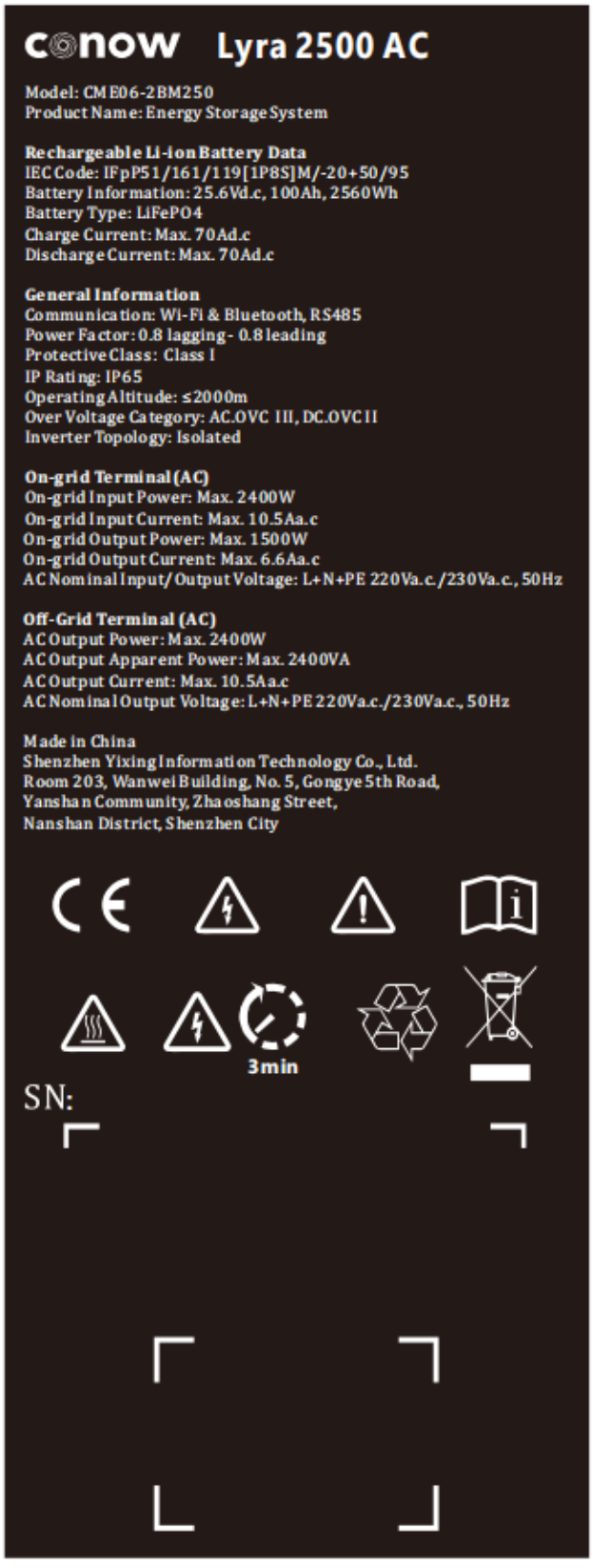
Contents

Revision history of test report

Issued Date	Description	Report Number
2026-04-12	Initial issue.	LS2A25112702EGDE01
Supplementary information: Test results documented in this report are taken from test report no. LS2A25112703EGDE01, issued by Lyns-tci Technology Guangdong Co., Ltd. on 2026-04-12.		

Copy of marking plate





Note:

The marking plates shown above may be only a draft. The use of certification marks on products must be approved by the respective NCBs to which these marks belong.

The marking plate is attached to the side surface or the back of the enclosure and is visible after installation.

General remarks - documentation

Possible test case verdicts

Test case does not apply to the test object ...: N/A

Test case is not rated .....: N/R

Test item does meet the requirement .....: P (Pass)

Test item does not meet the requirement ....: F (Fail)

Testing

Date of receipt of test items .....: 2025-12-25

Date(s) of performance of tests .....: 2025-12-25 to 2026-04-03

General remarks:

The test result presented in this report relate only to the object(s) tested. This report shall not be reproduced in part or in full without the written approval of the issuing testing laboratory.

”(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

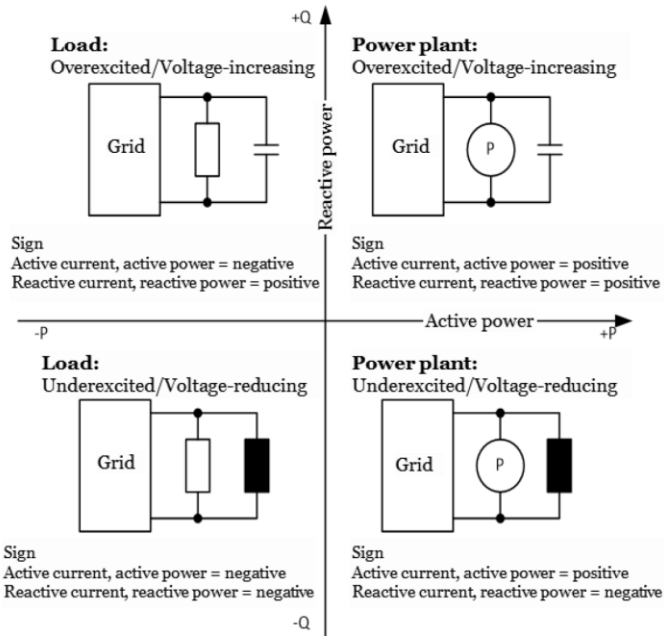
Throughout this report a ☒comma / ☐point is used as the decimal separator.

Conformity statements are decided in accordance with ILAC-G8:09/2019 Binary Statement for Simple Acceptance Rule, unless otherwise normatively specified or contractually agreed.

Direction definition of P and Q:

in this test report, the regarded system of the voltage and current vectors is the active sign convention system:

- If the inverter feeds to the grid the active power is measured with positive sign.
- If the inverter injects reactive power / current with leading power factor the reactive power / current is marked “leading” or “inductive” (under-excited) or has a negative sign.
- If the inverter injects reactive power / current with lagging power factor the reactive power / current is marked “lagging” or “capacitive” (over-excited) or has a positive sign.



General remarks for testing

Test setup:

For the testing 3 test setups were used:

a) *Test setup 1:* used for tests except islanding prevention testing.

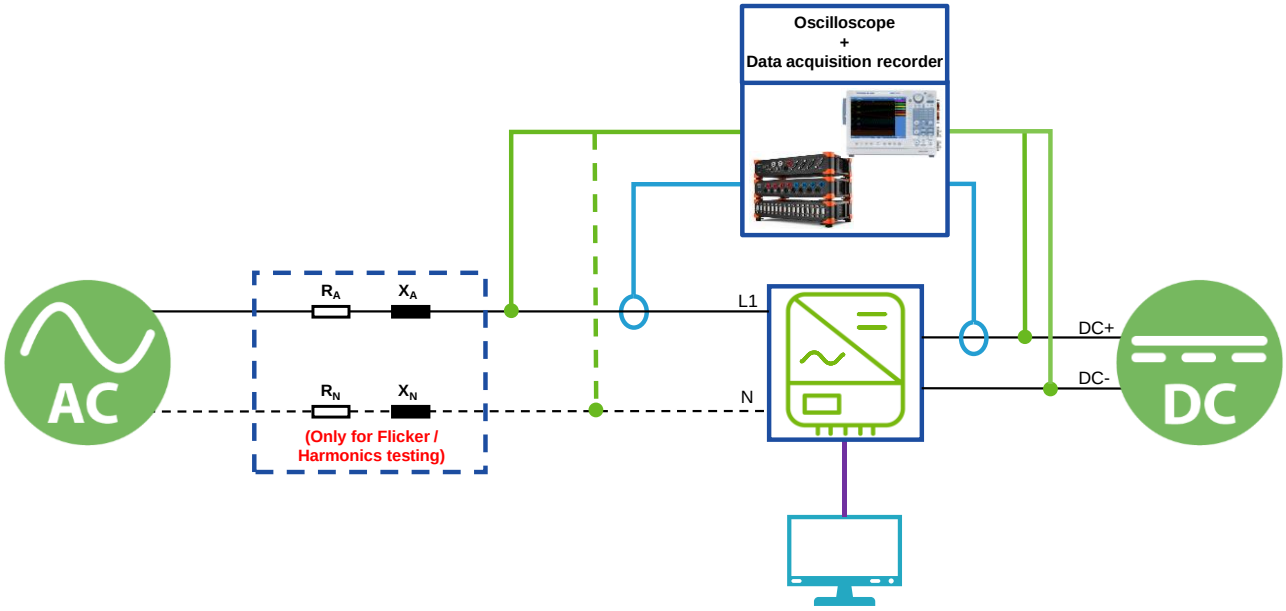


Figure 1 – Test setup 1

b) *Test setup 2:* Basic test configuration for $P_{AV,E}$ -Control

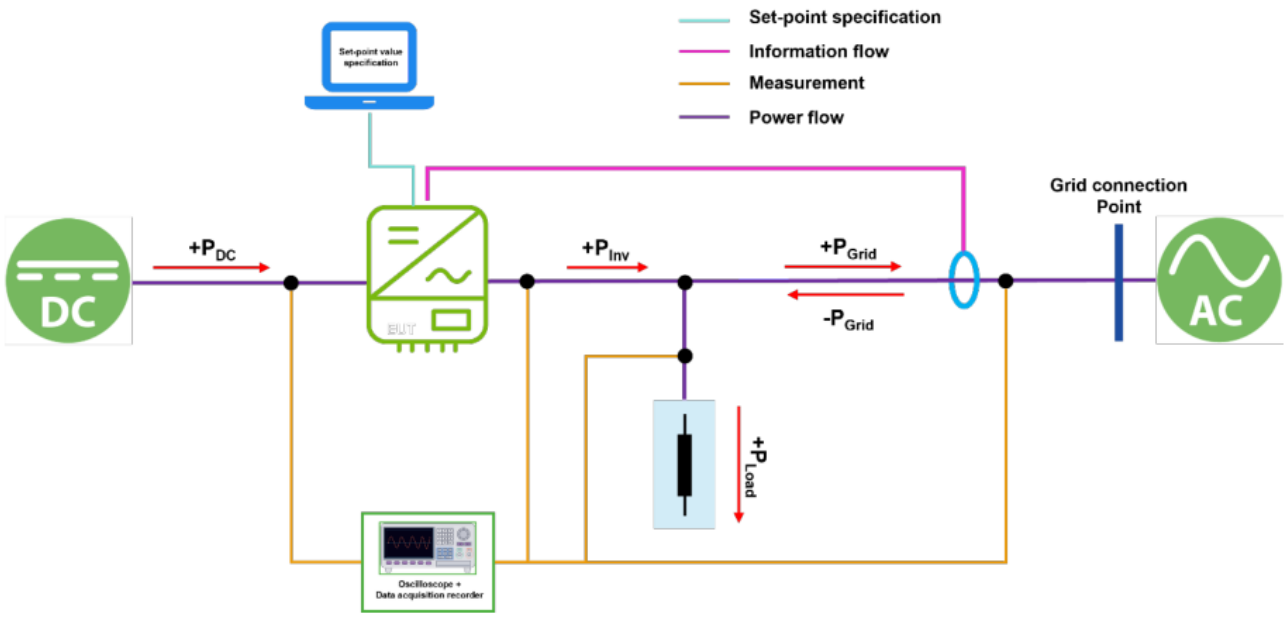


Figure 2 –Test circuit for $P_{AV,E}$ -Control in a power conditioner (inverter)

General remarks for testing

c) *Test setup 3:* Basic test configuration for islanding detection function

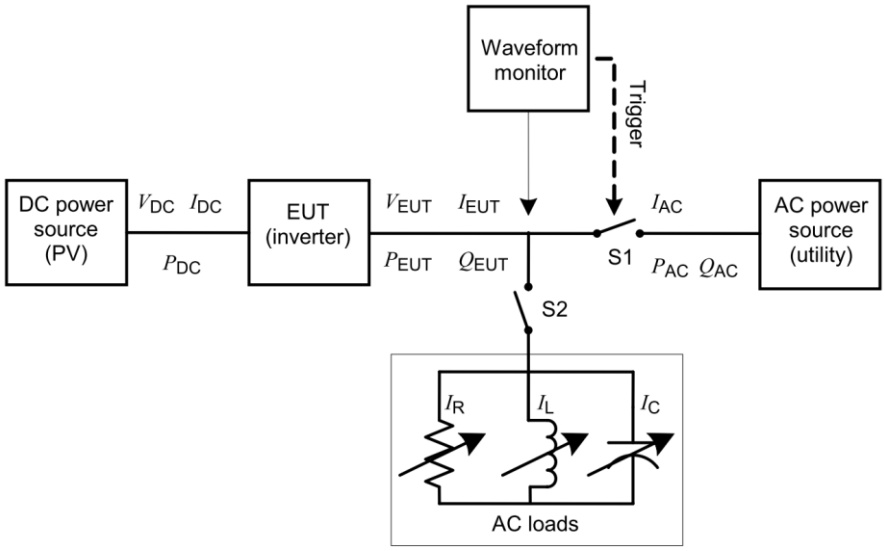


Figure 3 – Test circuit for islanding detection function in a power conditioner (inverter) from IEC 62116:2014

General product information

Equipment mobility	:	Permanent connection
Operating condition	:	Continuous
Class of equipment	:	Class I
Protection against ingress of water	:	IP65 according to EN 60529
Mass of equipment [kg]	:	26,5±0,5 Kg

General product information

The storage Inverter is a single-phase type, The inverter input voltage supply can be supplied DC voltage by battery, and the output can connect to the grid. (See Figure 4)

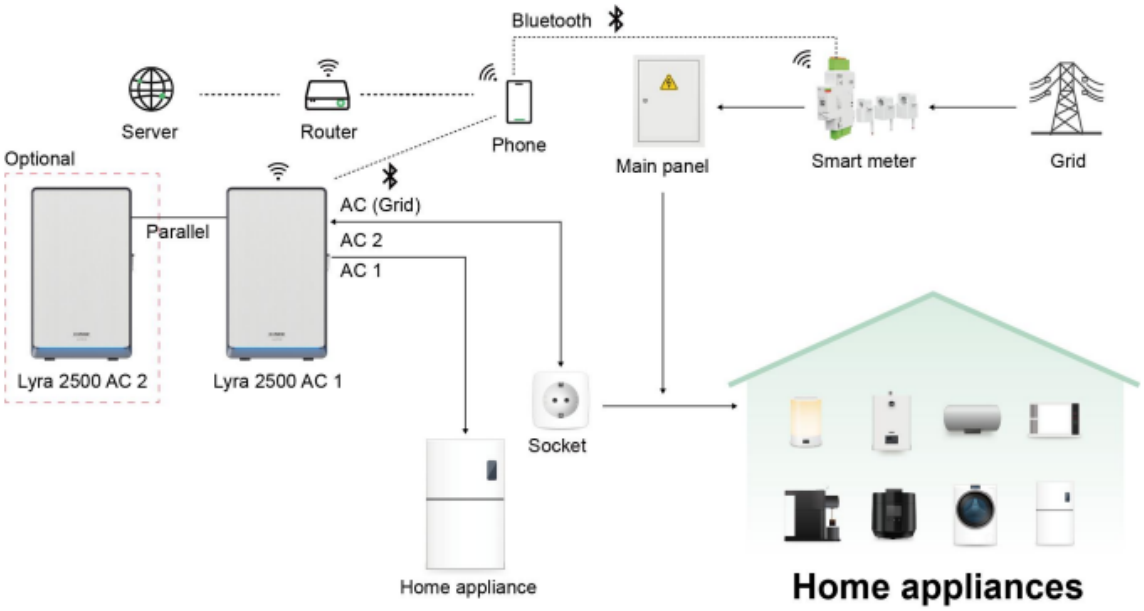


Figure 4 – Scheme of an installation

The tests were performed on the EUT **CME06-2BM250**.

Hardware Version: V1.0.0

Software Version: V1.01.02

General product information

Description of the power circuit (Figure 4 & Figure 5):

This balcony energy storage system consists of four main modules: micro-inverter, battery BMS, LED light panel and BCU main control unit.

The internal control system is redundantly constructed, consisting of a master microcontroller CPU 1 (IC7) and a slave CPU 2 (IC16).

Master CPU 1 (IC7) measures information load voltages and currents, such as those from the inverter, battery voltage and current, as well as bus voltage and heatsink temperature; controls relays through switching signals; exchanges system status data with slave CPU 2 (IC16); optimizes the charging and discharging power of grid systems; and manages the system's operating modes.

Slave CPU 2 (IC16) measures battery voltage and current, and heatsink temperature information; performs ground insulation resistance tests before startup; and communicates with master CPU 1 (IC7) to receive control commands.

The grid-connected section achieves dual protection for battery systems through an isolation transformer and dual relays: even if a single relay fails, the other relay will disconnect, and the synchronization of the isolation transformer maintains insulation and disconnection. When a relay abnormality is detected, the system triggers an alarm and displays an error code. In the event of a fault, the master and slave DSPs coordinate to initiate protection, and if necessary, the low-voltage side is disconnected through relays or the isolation transformer to ensure basic insulation between the battery system and the grid.

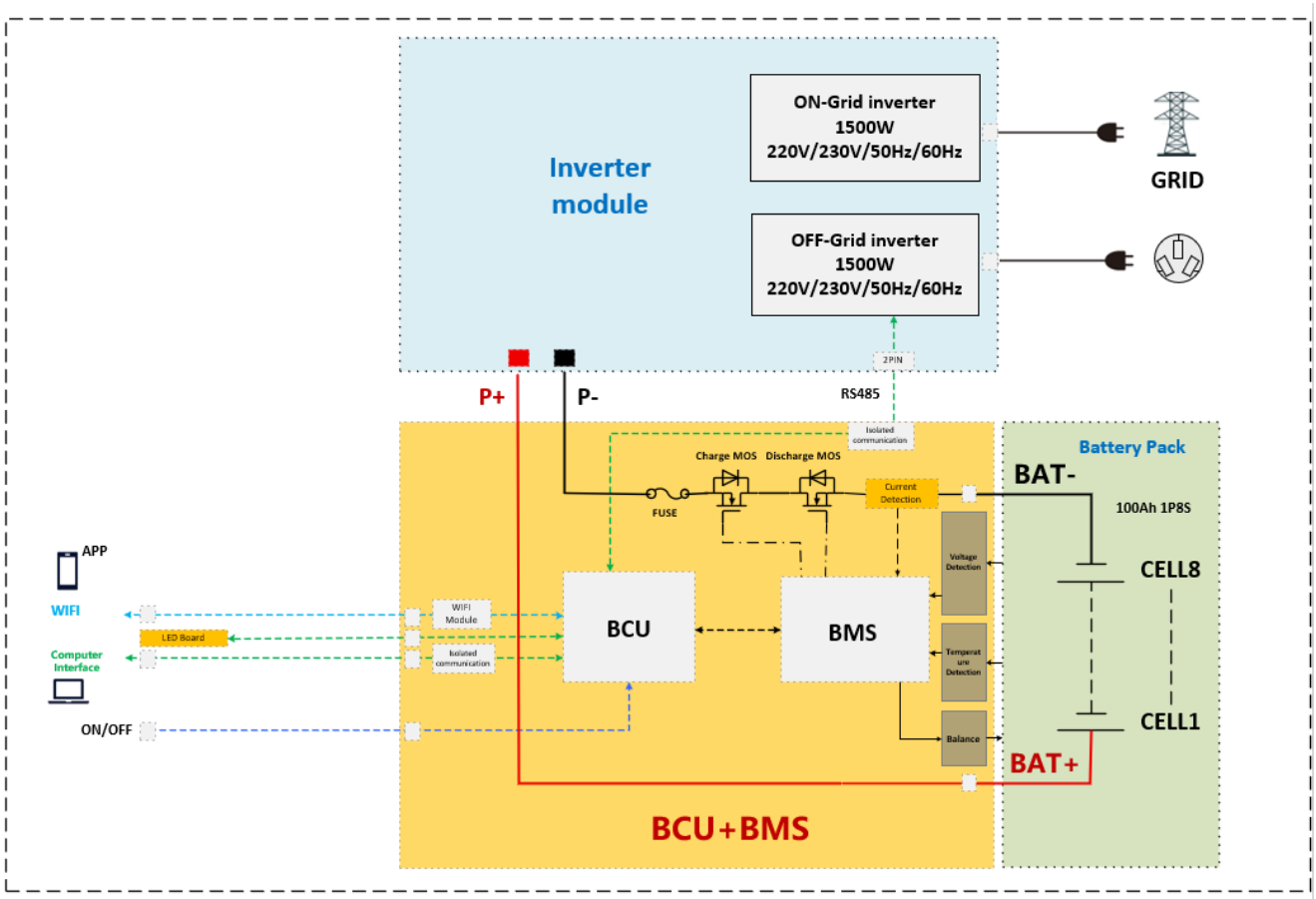


Figure 5 – Block diagram (Energy Storage System)

General product information

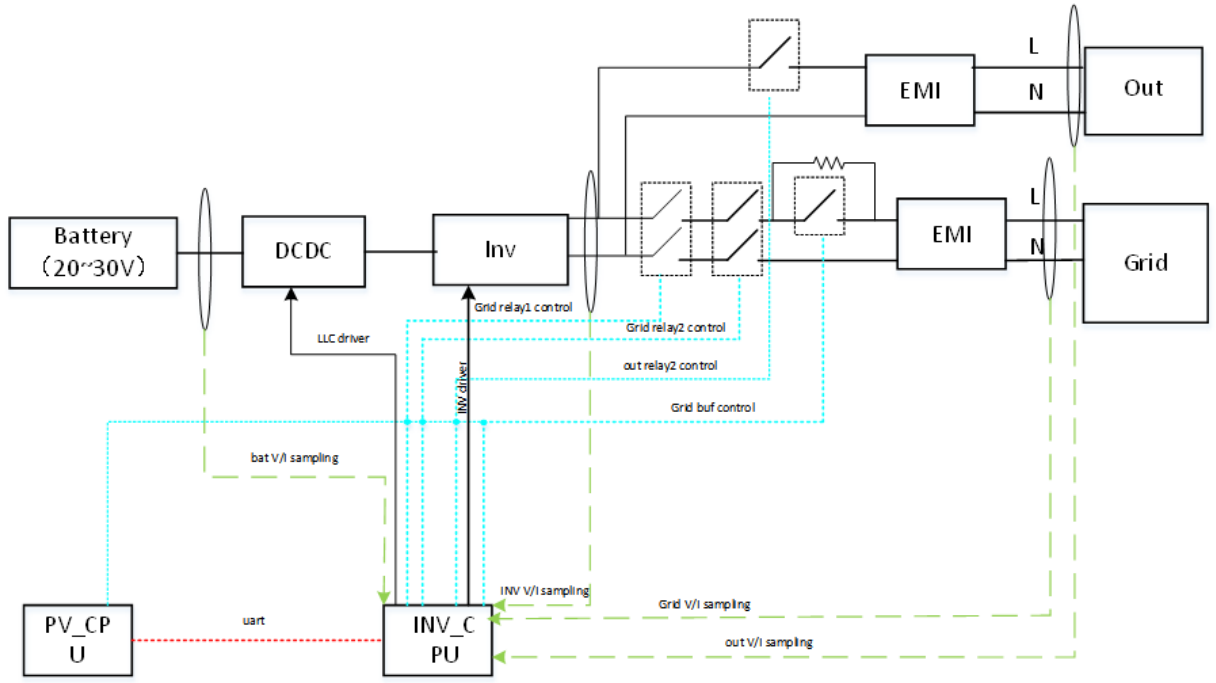


Figure 6 – Block diagram (Inverter module)

Differences of the model:

The units in the product series. This includes:

- with the same control electronics.
- with the same construction solutions including the power components.
- with the same number of phases.
- with the same identical power electronics, filters, and measuring transducers.

The implemented control and firmware are identical across all devices. There are no differences in AC behaviour between the PGU types, except for variations in power rating and current limitation specific to each device.

Assessment

Clause/§	Requirement	Verdict
5.2	**Evidence of permissible network perturbations**	
5.2.1	General	**P**
5.2.2	Rapid voltage changes	**P**
5.2.3	Flicker	**P**
5.2.4	Harmonics and interharmonics	**P**
5.2.4.1 a)	Test Harmonics DIN EN 61000-3-2 (≤16 A per Phase)	**P**
5.2.4.1 a)	Test Harmonics DIN EN 61000-3-12 (≥16 A and ≤75 A per Phase)	**N/A**
5.2.4.1 b)	Test Harmonics and interharmonics DIN EN 61000-4-7 (≥75 A per Phase)	**P**
5.2.5	Commutation	**N/A**
5.2.6	Feed in of DC current	**P**
5.3	**Evidence of symmetry behaviour of inverters**	
5.3.1	General	**N/A**
5.3.2.1	Calculation of the asymmetry of three-phase inverters	**N/A**
5.3.2.2.1	Failure of single inverter modules	**N/A**
5.3.2.2.2	Power drop of single inverter modules	**N/A**
5.3.2.3.2	Symmetrical operation with a symmetry device	**N/A**
5.4	**Evidence of the behaviour of the generating unit on the network**	
5.4.1	General	**P**
5.4.2	Measurement of the active and reactive power range	**P**
5.4.3.3	Measurement of setting accuracy	**P**
5.4.3.4	Measurement of the power gradient	**P**
5.4.3.5	Measurement Priority Interfaces / Energy Management	**P**
5.4.4	Active power feed-in for PGUs at over-frequency	**N/A**
5.4.5	Active power feed-in of Storage systems for over-frequency	**P**
5.4.6	Active power feed-in for PGUs at underfrequency	**N/A**
5.4.8	Static voltage stability / reactive power supply	**P**
5.4.8.2	Tests of the Reactive power / cos φ setting accuracy	**P**
	The regulating and control behaviour of the reactive power	**P**
5.4.8.3	Test of the displacement factor/active power characteristic curve cos φ (P)	**P**
	Test 1) for conducted PGUs - Accuracy (characteristic)	**P**
	Test 2) for conducted PGUs - dynamics	**N/A**
	Test 3) supply-dependent PGUs - Accuracy (characteristic curve)	**P**
	Test 4) supply-dependent PGUs – Dynamic	**P**
5.4.8.4.1	Test of the accuracy of the Q(U) regulation	**N/A**
5.4.8.4.2	Test of the dynamics of the Q(U) regulation	**N/A**

Assessment

Clause/§	Requirement	Verdict
5.5	**NS-protection**	
5.5.2	NS protection	**P**
5.5.2.1	Functional safety	**P**
5.5.3	Central NS-protection	**N/A**
5.5.4	Integrated NS-protection	**P**
5.5.6	Interface switch	**P**
5.5.6.2	Central interface switch	**N/A**
5.5.6.3	Integrated interface switch	**P**
5.5.7.2	Check of setting values	**P**
5.5.7.3	Wiring check	**N/A**
5.5.7.4	Voltage and frequency control	**P**
5.5.7.4.1	Voltage and frequency control – Single Phase	**P**
	Voltage and frequency control – Multi Phase (Phase to N)	**N/A**
	Voltage and frequency control – Multi Phase (Phase to Phase)	**N/A**
	Voltage and frequency control – Measuring the rise-in voltage protection as a running 10-minute mean value	**P**
	Voltage and frequency control – Frequency measurement	**P**
5.5.7.5	Reporting of NS protection	**P**
5.5.9	Constructional characteristics of NS protection	**P**
5.5.10.1	General	**P**
5.5.10.2	Passive Islanding Protection	**N/A**
5.5.10.3	Islanding protection according to table 6 – Load imbalance (real, reactive load) for test condition A (PGU output = 100%)	**P**
	Islanding protection according to table 7 – Load imbalance (real, reactive load) for test condition B (PGUT output = 66%)	**P**
	Islanding protection according to table 8 – Load imbalance (real, reactive load) for test condition C (PGU output = 33%)	**P**
5.6	**Connecting conditions and synchronization**	
5.6.1	General	**P**
5.6.2	Connecting conditions and synchronisation	**P**
5.7	**Evidence of $P_{AV,E}$ - Control**	
5.7.1	General	**P**
5.7.2.1	Test control dynamic	**P**
5.7.2.2	Test disconnection function	**P**
5.8	**Evidence dynamic grid support**	
5.8.1	General	**P**
5.8.3	Testing of the dynamic grid support PGU Type 1	**N/A**

Assessment

Clause/§	Requirement	Verdict
5.8.3	Testing of the dynamic grid support PGU Type 2	**P**
5.9	**Test of Ancillary Unit**	

Annex 1– Test Results

5.2	Evidence of permissible network perturbations	
5.2.1	**General**	**P**
The electrical installations of the customer system shall be planned, constructed and operated so that reactions to the network operator's network and to the systems of other customers are permanently reduced to a permissible minimum. Should interfering reactions on the network operator's network occur nonetheless, the customer shall apply measures to his system that are to be coordinated with the network operator. The network operator is entitled to disconnect the power generation system concerned from the network until the deficiencies are corrected. System perturbations are defined as: - Rapid voltage changes - Flicker - Harmonics, interharmonics and higher frequencies (up to 9 kHz)		

5.2.2 Rapid voltage changes	P

The purpose of the test is to determine k_i and k_{imax}.

The following three cases must be tested (where applicable).

- Switch-on for any capacity
- Unfavourable case when switching the generator step
- Switch-on for nominal capacity

Note: For PV-plants the inverter is the generator

- Switch-off for nominal capacity (no emergency shutdown, but operative shutdown)

If the manufacturer knows more critical cases (e.g. different cos φ parameters) then these additional have to be tested

Test conditions:

Frequency: 50 Hz ± 0,5%

THD of the voltage supply: ≤ 3 %

Voltage rises of the PGU at 100 P_{Emax} %: ≤ 3 %

Assessment criterion:

Limits:

k_{imax} = 1,2 for synchronous generators with fine synchronization, converter; (electronic inverter)

k_{imax} = 4 for asynchronous generators, which are switched on at 95% to 105% of their synchronous speed, if no further details are available regarding the type of current limitation. With regard to short-term compensation processes, the condition mentioned below for very short voltage changes must also be observed.

K_{imax} = 8 for asynchronous generators that are powered up by the network if I_a is unknown.

(I_a = starting current)

CME06-2BM250

Switch-on for any capacity (10% P_{Emax})

Phase	**L1**			**L2**			**L3**		
Single period effective values of the current [A]	0,718	0,767	0,700	--	--	--	--	--	--
Single period effective values of the voltage [V]	230,99	230,86	230,99	--	--	--	--	--	--
k_i value [1]	0,110	0,118	0,107	--	--	--	--	--	--
k_{imax} value [1]	0,118			--			--		

Unfavourable case when switching the generator step (not necessary for electronic inverter)

Phase	**L1**			**L2**			**L3**		
Single period effective values of the current [A]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Single period effective values of the voltage [V]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
k_i value [1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
k_{imax} value [1]	N/A			N/A			N/A		

Switch-on for nominal capacity

Phase	**L1**			**L2**			**L3**		
Single period effective values of the current [A]	0,943	1,348	0,404	--	--	--	--	--	--
Single period effective	227,47	227,70	228,13	--	--	--	--	--	--

values of the voltage [V]									
k_i value [1]	0,145	0,207	0,062	--	--	--	--	--	--
k_{imax} value [1]	0,207			--			--		
Switch-off for nominal capacity									
Phase	**L1**			**L2**			**L3**		
Single period effective values of the current [A]	0,757	0,694	0,707	--	--	--	--	--	--
Single period effective values of the voltage [V]	230,84	230,87	231,85	--	--	--	--	--	--
k_i value [1]	0,116	0,106	0,108	--	--	--	--	--	--
k_{imax} value [1]	0,116			--			--		

Grid Frequency [Hz]	50,00
Grid voltage [V]	230,0
Rated current I_r [A]	6,520
Highest k_{imax} value for all switching operations [1]	0,207

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.2.3 Flicker **These tests are designed to provide evidence that the requirements of VDE-AR-N 4100:2019-04 are met.**	**P**

Adherence to the thresholds for flicker must be verified as followed:

- For nominal currents ≤ 16 A per conductor to DIN EN 61000-3-3 (VDE 0838-3)
- For nominal currents > 16 A and ≤ 75 A per conductor to DIN EN 61000-3-11 (VDE 0838-11)

Test conditions:

Voltage: 86% U_n to 109% U_n

Frequency: 50 Hz ± 0,5%

THD of the voltage supply: ≤ 3 %

Voltage rises of the PGU at 100% P_{Emax}: ≤ 3 %

Assessment criterion:

Long-term flicker strength Plt to DIN EN 61000-3-3 (VDE 0838-3) must be ≤ 0,5.

Determination of the flicker coefficient:

$$c_{\psi k} = P_{st} \times (S_k / P_n)$$

where S_k is the short-circuit power of the network standby element (during the determination of the appropriate P_{st} values)

The value for the network standby element must be determined separately with measurements for rated currents > 75 A.

Note:

Grid impedance DIN EN 61000-3-3 (VDE 0838-3) [Ω]:	R_A = 0,24Ω jX_A = 0,15Ω / R_N = 0,16Ω jX_N = 0,10Ω (Rn and jXn only for single-phase units used!)
Grid impedance DIN EN 61000-3-11 (VDE 0838-11) [Ω]:	R_A = 0,24Ω jX_A = 0,15Ω / R_N = 0,16Ω jX_N = 0,10Ω (Rn and jXn only for line to neutral single-phase or three units used!) R_A = 0,15Ω jX_A= 0,15Ω / R_N = 0,01Ω jX_N= 0,01Ω (Rn and jXn only for line to line three-phase units used!)

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Test result:

a) Flicker to DIN EN 61000-3-11 (VDE 0838-3) for generator units ≤ 75 A						**P**
EUT		**Selection of limits**				
☒	☐	☒		☐		
1- phase	**3-phase**	Equipment with rated current ≤16 A per phase		Equipment with rated current ≤75 A per phase		
CME06-2BM250		*IEC EN 61000-3-3*		*IEC EN 61000-3-11*		
		d_{max}	d_c	T_{max}	P_{st}	P_{lt}
Phase L1		1,860	1,059	0	0,078	0,072
Phase L2		--	--	--	--	--
Phase L3		--	--	--	--	--
Output voltage of the impedance network [V]				230,0		
Reference impedance according the standard:						
☒ Grid impedance DIN EN 61000-3-3 (VDE 0838-3) [Ω]:		R_A = 0,24Ω jX_A = 0,15Ω / R_N = 0,16Ω jX_N = 0,10Ω (Rn and jXn only for single-phase units used!)				

☐	Grid impedance DIN EN 61000-3-11 (VDE 0838-3) [Ω]:	R_A = 0,24Ω jX_A = 0,15Ω / R_N = 0,16Ω jX_N = 0,10Ω (Rn and jXn only for line to neutral single-phase or three units used!)
☐	Grid impedance DIN EN 61000-3-11 (VDE 0838-3) [Ω]:	R_A = 0,15Ω jX_A= 0,15Ω / R_N = 0,01Ω jX_N= 0,01Ω (Rn and jXn only for line to line three-phase units used!)

Flicker for rated currents ≤75A to DIN EN 61000-3-11 (VDE 0838-3)	
Assessment criterion: Long-term flicker strength: P_{lt}≤0,5	
Grid impedance angle ψ_k	☒ 32° or ☐ 45
Flicker coefficient c(ψ_k)	1,560

b) Flicker to DIN EN 61000-3-3 (VDE 0838-3) for generator units > 75 A					**N/A**
Adherence to the thresholds for flicker must be verified as followed: - For PGUs (power generation units) and PSUs (power supply units) intended for PGSs (power generation systems) with nominal currents > 75 A, the measurements must be conducted as in 5.2.3.2.					
Test conditions: Voltage: 86% U_n to 109% U_n Frequency: 50 Hz ± 0,5% THD of the voltage supply: ≤ 3 % Voltage rise of the PGU at 100% P_{Emax}: ≤ 3 %					
Assessment criterion: Long-term flicker strength: P_{lt}≤0,5					
Test result :					
Flicker for rated currents >75A (at SCR = 20) (Calculation Flickermeter according to TG3)					
Rated Output voltage [V]	--				
Grid impedance angle ψ_k [°]	30	50	70	85	
Flicker coefficient c(ψ_k) [1]	--	--	--	--	
Short-term Flicker P_{st} [1]	--	--	--	--	
Flicker step factor k(fψ_k) [1]	--	--	--	--	
Voltage change factor k(uψ_k) [1]	--	--	--	--	

5.2.4	Harmonics and interharmonics	P

5.2.4.1 a)	Harmonics test	P

EUT		Selection of limits		
☒	☐	☒	☐	☐
1-phase	*3-phase*	Class A equipment with input current ≤16 A per phase	Equipment with input current >16 A and ≤75 A per phase	Equipment with input current >75 A per phase
CME06-2BM250		***IEC EN 61000-3-2***	***IEC EN 61000-3-12***	

Phase	**L1**	**L2**	**L3**
Power Level	**33%**	**33%**	**33%**
AC Power [W]	491	--	--
AC Voltage [V]	230,2	--	--
AC Current [A]	2,135	--	--
Frequency [Hz]	50,00	--	--

Harmonic	**Measured value I_h [A]**			**Measured value I_h [%I_1]**			**Limits [A]** IEC EN 61000-3-2
	L1	**L2**	**L3**	**L1**	**L2**	**L3**	
1st	2,135	--	--	--	--	--	--
2nd	0,023	--	--	1,086	--	--	1,080
3rd	0,080	--	--	3,732	--	--	2,300
4th	0,015	--	--	0,702	--	--	0,430
5th	0,072	--	--	3,353	--	--	1,140
6th	0,015	--	--	0,708	--	--	0,300
7th	0,083	--	--	3,892	--	--	0,770
8th	0,009	--	--	0,404	--	--	0,263
9th	0,048	--	--	2,269	--	--	0,400
10th	0,009	--	--	0,426	--	--	0,184
11th	0,031	--	--	1,464	--	--	0,330
12th	0,006	--	--	0,271	--	--	0,153
13th	0,034	--	--	1,610	--	--	0,210
14th	0,004	--	--	0,175	--	--	0,131
15th	0,038	--	--	1,775	--	--	0,150
16th	0,002	--	--	0,114	--	--	0,115
17th	0,027	--	--	1,281	--	--	0,132
18th	0,005	--	--	0,249	--	--	0,102
19th	0,023	--	--	1,069	--	--	0,188
20th	0,003	--	--	0,141	--	--	0,092
21th	0,019	--	--	0,871	--	--	0,107
22th	0,004	--	--	0,185	--	--	0,084
23th	0,016	--	--	0,737	--	--	0,098
24th	0,002	--	--	0,097	--	--	0,077
25th	0,014	--	--	0,641	--	--	0,090

26th	0,002	--	--	0,112	--	--	0,071
27th	0,011	--	--	0,513	--	--	0,080
28th	0,002	--	--	0,112	--	--	0,066
29th	0,009	--	--	0,411	--	--	0,078
30th	0,004	--	--	0,189	--	--	0,061
31th	0,008	--	--	0,383	--	--	0,073
32th	0,002	--	--	0,115	--	--	0,057
33th	0,008	--	--	0,352	--	--	0,068
34th	0,003	--	--	0,129	--	--	0,054
35th	0,007	--	--	0,315	--	--	0,064
36th	0,003	--	--	0,133	--	--	0,051
37th	0,006	--	--	0,259	--	--	0,061
38th	0,003	--	--	0,123	--	--	0,048
39th	0,006	--	--	0,281	--	--	0,058
40th	0,002	--	--	0,107	--	--	0,046
THD [%]	--	--	--	7,854	--	--	--

Phase	**L1**	**L2**	**L3**
Power Level	**66%**	**66%**	**66%**
AC Power [W]	992	--	--
AC Voltage [V]	230,2	--	--
AC Current [A]	4,310	--	--
Frequency [Hz]	50,00	--	--

Harmonic	**Measured value I_h [A]**			**Measured value I_h [%I_1]**			**Limits [A]** IEC EN 61000-3-2
	L1	**L2**	**L3**	**L1**	**L2**	**L3**	
1st	4,310	--	--	--	--	--	--
2nd	0,042	--	--	0,980	--	--	1,080
3rd	0,028	--	--	0,659	--	--	2,300
4th	0,010	--	--	0,240	--	--	0,430
5th	0,038	--	--	0,890	--	--	1,140
6th	0,013	--	--	0,303	--	--	0,300
7th	0,045	--	--	1,051	--	--	0,770
8th	0,013	--	--	0,300	--	--	0,263
9th	0,038	--	--	0,889	--	--	0,400
10th	0,009	--	--	0,214	--	--	0,184
11th	0,036	--	--	0,824	--	--	0,330
12th	0,004	--	--	0,085	--	--	0,153
13th	0,034	--	--	0,786	--	--	0,210
14th	0,007	--	--	0,163	--	--	0,131
15th	0,031	--	--	0,718	--	--	0,150
16th	0,005	--	--	0,108	--	--	0,115

17th	0,022	--	--	0,499	--	--	0,132
18th	0,003	--	--	0,075	--	--	0,102
19th	0,022	--	--	0,515	--	--	0,188
20th	0,002	--	--	0,049	--	--	0,092
21th	0,019	--	--	0,450	--	--	0,107
22th	0,004	--	--	0,088	--	--	0,084
23th	0,014	--	--	0,325	--	--	0,098
24th	0,003	--	--	0,067	--	--	0,077
25th	0,012	--	--	0,283	--	--	0,090
26th	0,003	--	--	0,069	--	--	0,071
27th	0,010	--	--	0,224	--	--	0,080
28th	0,002	--	--	0,056	--	--	0,066
29th	0,007	--	--	0,172	--	--	0,078
30th	0,004	--	--	0,098	--	--	0,061
31th	0,007	--	--	0,165	--	--	0,073
32th	0,003	--	--	0,068	--	--	0,057
33th	0,007	--	--	0,154	--	--	0,068
34th	0,003	--	--	0,069	--	--	0,054
35th	0,007	--	--	0,163	--	--	0,064
36th	0,003	--	--	0,070	--	--	0,051
37th	0,006	--	--	0,136	--	--	0,061
38th	0,003	--	--	0,064	--	--	0,048
39th	0,006	--	--	0,140	--	--	0,058
40th	0,002	--	--	0,052	--	--	0,046
THD [%]	---	---	---	2,717	--	--	--

Phase	**L1**	**L2**	**L3**
Power Level	**100%**	**100%**	**100%**
AC Power [W]	1501	--	--
AC Voltage [V]	230,4	--	--
AC Current [A]	6,515	--	--
Frequency [Hz]	50,00	--	--

Harmonic	**Measured value I_h [A]**			**Measured value I_h [%I_1]**			**Limits [A]** IEC EN 61000-3-2
	L1	**L2**	**L3**	**L1**	**L2**	**L3**	
1st	6,515	--	--	--	--	--	--
2nd	0,071	--	--	1,092	--	--	1,080
3rd	0,033	--	--	0,511	--	--	2,300
4th	0,016	--	--	0,241	--	--	0,430
5th	0,028	--	--	0,436	--	--	1,140
6th	0,010	--	--	0,159	--	--	0,300
7th	0,028	--	--	0,433	--	--	0,770

8th	0,009	--	--	0,136	--	--	0,263
9th	0,027	--	--	0,417	--	--	0,400
10th	0,008	--	--	0,125	--	--	0,184
11th	0,018	--	--	0,270	--	--	0,330
12th	0,007	--	--	0,109	--	--	0,153
13th	0,017	--	--	0,257	--	--	0,210
14th	0,005	--	--	0,078	--	--	0,131
15th	0,022	--	--	0,336	--	--	0,150
16th	0,006	--	--	0,090	--	--	0,115
17th	0,016	--	--	0,240	--	--	0,132
18th	0,006	--	--	0,086	--	--	0,102
19th	0,017	--	--	0,260	--	--	0,188
20th	0,003	--	--	0,040	--	--	0,092
21th	0,018	--	--	0,273	--	--	0,107
22th	0,004	--	--	0,069	--	--	0,084
23th	0,014	--	--	0,216	--	--	0,098
24th	0,003	--	--	0,047	--	--	0,077
25th	0,014	--	--	0,209	--	--	0,090
26th	0,003	--	--	0,050	--	--	0,071
27th	0,010	--	--	0,153	--	--	0,080
28th	0,003	--	--	0,045	--	--	0,066
29th	0,009	--	--	0,135	--	--	0,078
30th	0,005	--	--	0,071	--	--	0,061
31th	0,008	--	--	0,123	--	--	0,073
32th	0,002	--	--	0,036	--	--	0,057
33th	0,007	--	--	0,107	--	--	0,068
34th	0,002	--	--	0,035	--	--	0,054
35th	0,008	--	--	0,115	--	--	0,064
36th	0,003	--	--	0,041	--	--	0,051
37th	0,006	--	--	0,090	--	--	0,061
38th	0,003	--	--	0,043	--	--	0,048
39th	0,006	--	--	0,097	--	--	0,058
40th	0,003	--	--	0,045	--	--	0,046
THD [%]	--	--	--	1,680	--	--	--

Voltage of defined Battery [V]	32,3
Current of defined Battery [A]	49,5
Impedance [Ω]	
Line	R_A = 0,24 jX_A = 0,15
Neutral	R_N = 0,16 jX_N = 0,10

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.2.4.1 b)	Test Harmonics DIN EN 61000-4-7 (≥75 A per Phase)	P

Harmonics: CME06-2BM250

L1 phase

P/ P_{rE} [%]	5	10	20	30	40	50	60	70	80	90	100
Order	I_h [%]										
1	5,058	9,999	20,036	30,070	40,054	50,062	60,074	70,063	80,036	90,001	99,898
2	0,204	0,314	0,357	0,354	0,384	0,479	0,579	0,671	0,791	0,916	1,091
3	1,867	2,229	1,978	1,346	0,860	0,591	0,471	0,383	0,392	0,431	0,510
4	0,226	0,329	0,232	0,235	0,212	0,162	0,154	0,166	0,188	0,220	0,241
5	1,255	1,084	1,164	1,158	0,958	0,781	0,649	0,557	0,484	0,444	0,435
6	0,220	0,206	0,195	0,220	0,223	0,208	0,202	0,198	0,189	0,165	0,159
7	1,550	1,563	1,063	1,235	1,270	1,087	0,840	0,596	0,474	0,442	0,432
8	0,160	0,165	0,151	0,130	0,158	0,191	0,200	0,190	0,172	0,136	0,136
9	1,212	1,143	1,015	0,721	0,816	0,757	0,640	0,566	0,531	0,485	0,417
10	0,139	0,144	0,147	0,143	0,127	0,146	0,147	0,136	0,126	0,121	0,125
11	0,871	0,785	0,738	0,540	0,449	0,524	0,545	0,505	0,443	0,365	0,270
12	0,104	0,095	0,083	0,093	0,071	0,061	0,055	0,061	0,079	0,114	0,108
13	0,577	0,567	0,503	0,557	0,404	0,485	0,546	0,489	0,367	0,275	0,257
14	0,063	0,068	0,060	0,049	0,063	0,067	0,089	0,119	0,130	0,108	0,078
15	0,522	0,528	0,563	0,563	0,525	0,479	0,505	0,435	0,383	0,365	0,335
16	0,027	0,027	0,031	0,039	0,054	0,073	0,073	0,068	0,045	0,054	0,090
17	0,434	0,444	0,434	0,403	0,418	0,310	0,313	0,340	0,353	0,307	0,240
18	0,048	0,055	0,069	0,083	0,082	0,090	0,062	0,049	0,082	0,099	0,086
19	0,421	0,417	0,374	0,356	0,366	0,281	0,303	0,351	0,325	0,267	0,260
20	0,028	0,033	0,042	0,048	0,040	0,039	0,031	0,033	0,042	0,034	0,040
21	0,344	0,331	0,316	0,305	0,283	0,298	0,282	0,300	0,289	0,316	0,273
22	0,062	0,067	0,065	0,051	0,036	0,041	0,059	0,062	0,055	0,058	0,069
23	0,267	0,249	0,231	0,237	0,221	0,250	0,210	0,226	0,263	0,212	0,216
24	0,037	0,035	0,030	0,034	0,035	0,039	0,045	0,040	0,043	0,044	0,047
25	0,199	0,199	0,190	0,194	0,196	0,211	0,182	0,197	0,194	0,209	0,209
26	0,035	0,032	0,029	0,036	0,047	0,048	0,050	0,041	0,041	0,042	0,050
27	0,165	0,169	0,176	0,167	0,174	0,175	0,151	0,146	0,173	0,175	0,152
28	0,026	0,026	0,027	0,031	0,037	0,034	0,036	0,036	0,043	0,040	0,045
29	0,126	0,134	0,143	0,147	0,140	0,131	0,123	0,120	0,131	0,134	0,135
30	0,049	0,048	0,046	0,063	0,051	0,051	0,050	0,058	0,070	0,055	0,071
31	0,126	0,129	0,129	0,130	0,121	0,113	0,123	0,104	0,116	0,133	0,122
32	0,033	0,034	0,033	0,033	0,028	0,031	0,032	0,036	0,038	0,033	0,036
33	0,121	0,120	0,121	0,104	0,102	0,100	0,112	0,094	0,105	0,115	0,107
34	0,041	0,043	0,036	0,034	0,029	0,036	0,035	0,035	0,045	0,048	0,035
35	0,107	0,109	0,103	0,096	0,097	0,101	0,110	0,098	0,106	0,103	0,115
36	0,047	0,046	0,036	0,034	0,039	0,046	0,038	0,042	0,049	0,063	0,041
37	0,093	0,094	0,089	0,087	0,087	0,085	0,085	0,084	0,080	0,095	0,090
38	0,047	0,046	0,043	0,040	0,044	0,047	0,042	0,046	0,044	0,050	0,043
39	0,094	0,094	0,098	0,098	0,094	0,090	0,091	0,091	0,084	0,094	0,097
40	0,037	0,034	0,043	0,045	0,044	0,040	0,042	0,042	0,039	0,034	0,045
THC [%]	3,349	3,483	3,077	2,646	2,339	2,077	1,884	1,713	1,639	1,620	1,679

Interharmonics											
Test result:											
P/P_{rE} [%]	5	10	20	30	40	50	60	70	80	90	100
f [Hz]	I_h [%]										
75	0,078	0,085	0,090	0,094	0,096	0,097	0,098	0,099	0,102	0,099	0,102
125	0,083	0,092	0,101	0,106	0,109	0,112	0,113	0,115	0,117	0,117	0,117
175	0,078	0,082	0,087	0,089	0,093	0,093	0,095	0,096	0,097	0,097	0,098
225	0,081	0,088	0,094	0,098	0,103	0,103	0,103	0,105	0,107	0,104	0,108
275	0,079	0,085	0,090	0,094	0,098	0,099	0,101	0,102	0,104	0,097	0,104
325	0,078	0,085	0,090	0,094	0,097	0,099	0,100	0,101	0,103	0,099	0,104
375	0,079	0,085	0,090	0,093	0,097	0,098	0,100	0,101	0,103	0,105	0,104
425	0,079	0,084	0,089	0,092	0,097	0,097	0,100	0,101	0,102	0,101	0,104
475	0,079	0,086	0,089	0,092	0,096	0,097	0,098	0,101	0,102	0,101	0,104
525	0,079	0,083	0,088	0,092	0,096	0,097	0,098	0,101	0,103	0,091	0,105
575	0,078	0,083	0,087	0,092	0,095	0,096	0,099	0,100	0,103	0,102	0,105
625	0,078	0,083	0,088	0,091	0,095	0,097	0,099	0,101	0,103	0,096	0,105
675	0,079	0,083	0,088	0,098	0,095	0,096	0,099	0,101	0,102	0,119	0,109
725	0,079	0,083	0,087	0,091	0,094	0,096	0,098	0,101	0,104	0,105	0,108
775	0,079	0,082	0,086	0,089	0,092	0,094	0,097	0,100	0,103	0,106	0,108
825	0,079	0,082	0,085	0,089	0,092	0,095	0,097	0,100	0,103	0,095	0,107
875	0,079	0,082	0,085	0,088	0,090	0,101	0,096	0,101	0,105	0,107	0,110
925	0,079	0,081	0,084	0,086	0,090	0,093	0,096	0,098	0,100	0,101	0,108
975	0,102	0,104	0,108	0,110	0,112	0,111	0,115	0,118	0,120	0,122	0,125
1025	0,079	0,082	0,085	0,085	0,088	0,091	0,094	0,097	0,100	0,102	0,108
1075	0,081	0,084	0,086	0,086	0,089	0,091	0,094	0,099	0,101	0,102	0,110
1125	0,095	0,096	0,100	0,095	0,102	0,109	0,107	0,112	0,116	0,106	0,131
1175	0,095	0,095	0,095	0,103	0,103	0,103	0,108	0,114	0,121	0,148	0,126
1225	0,080	0,081	0,083	0,086	0,090	0,093	0,095	0,097	0,099	0,098	0,107
1275	0,079	0,081	0,082	0,084	0,087	0,088	0,092	0,095	0,098	0,105	0,104
1325	0,080	0,081	0,082	0,081	0,084	0,087	0,091	0,093	0,097	0,092	0,104
1375	0,079	0,080	0,079	0,082	0,083	0,085	0,087	0,092	0,098	0,100	0,102
1425	0,130	0,128	0,128	0,107	0,122	0,131	0,130	0,140	0,142	0,114	0,172
1475	0,124	0,121	0,116	0,130	0,127	0,126	0,133	0,137	0,154	0,208	0,158
1525	0,095	0,091	0,082	0,079	0,082	0,090	0,088	0,094	0,110	0,096	0,103
1575	0,104	0,101	0,084	0,080	0,084	0,093	0,089	0,096	0,118	0,119	0,101
1625	0,114	0,114	0,087	0,080	0,085	0,102	0,093	0,100	0,127	0,139	0,100
1675	0,123	0,126	0,094	0,085	0,093	0,115	0,101	0,107	0,135	0,169	0,102
1725	0,134	0,140	0,108	0,098	0,110	0,133	0,113	0,121	0,146	0,194	0,117
1775	0,137	0,141	0,117	0,110	0,124	0,144	0,121	0,129	0,148	0,177	0,124
1825	0,130	0,134	0,126	0,120	0,134	0,144	0,124	0,133	0,140	0,164	0,126
1875	0,125	0,123	0,135	0,132	0,142	0,140	0,128	0,134	0,131	0,128	0,134
1925	0,116	0,112	0,139	0,139	0,142	0,129	0,129	0,135	0,119	0,107	0,140
1975	0,106	0,102	0,136	0,140	0,137	0,119	0,130	0,131	0,107	0,094	0,141

Higher Frequencies											
Test result:											
P/P_{rE} [%]	5	10	20	30	40	50	60	70	80	90	100
f [kHz]	I_h [%]										
2,1	0,227	0,223	0,281	0,296	0,279	0,244	0,283	0,274	0,222	0,205	0,313
2,3	0,170	0,170	0,183	0,197	0,184	0,173	0,198	0,188	0,175	0,183	0,230
2,5	0,150	0,149	0,150	0,152	0,151	0,151	0,156	0,157	0,158	0,158	0,177
2,7	0,135	0,135	0,134	0,136	0,136	0,138	0,138	0,140	0,144	0,144	0,156
2,9	0,110	0,109	0,109	0,110	0,111	0,111	0,113	0,114	0,117	0,122	0,126
3,1	0,081	0,081	0,081	0,081	0,082	0,082	0,083	0,084	0,086	0,089	0,092
3,3	0,055	0,055	0,055	0,055	0,055	0,056	0,056	0,057	0,058	0,057	0,061
3,5	0,035	0,035	0,035	0,035	0,035	0,036	0,037	0,037	0,037	0,038	0,039
3,7	0,023	0,023	0,023	0,023	0,023	0,023	0,023	0,023	0,024	0,024	0,025
3,9	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,016	0,016	0,016
4,1	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,013	0,013	0,013	0,014
4,3	0,008	0,008	0,007	0,008	0,007	0,007	0,008	0,008	0,008	0,008	0,008
4,5	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006
4,7	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005
4,9	0,005	0,005	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004
5,1	0,002	0,002	0,002	0,001	0,002	0,002	0,002	0,003	0,002	0,001	0,002
5,3	0,009	0,008	0,006	0,008	0,007	0,005	0,008	0,004	0,009	0,009	0,006
5,5	0,009	0,008	0,006	0,008	0,007	0,005	0,008	0,003	0,009	0,009	0,006
5,7	0,009	0,008	0,006	0,007	0,007	0,005	0,007	0,003	0,008	0,009	0,006
5,9	0,009	0,008	0,006	0,008	0,007	0,005	0,008	0,004	0,008	0,009	0,006
6,1	0,009	0,008	0,006	0,008	0,007	0,005	0,007	0,003	0,008	0,009	0,006
6,3	0,009	0,008	0,007	0,007	0,007	0,005	0,007	0,003	0,008	0,008	0,006
6,5	0,009	0,008	0,007	0,008	0,007	0,005	0,007	0,004	0,008	0,009	0,006
6,7	0,009	0,008	0,007	0,008	0,007	0,006	0,008	0,004	0,008	0,008	0,007
6,9	0,009	0,008	0,007	0,008	0,007	0,006	0,008	0,004	0,008	0,009	0,006
7,1	0,009	0,008	0,007	0,008	0,007	0,006	0,008	0,004	0,008	0,009	0,007
7,3	0,009	0,008	0,007	0,008	0,007	0,005	0,007	0,003	0,008	0,009	0,006
7,5	0,008	0,007	0,006	0,007	0,006	0,005	0,007	0,003	0,008	0,009	0,006
7,7	0,008	0,007	0,006	0,007	0,006	0,004	0,006	0,002	0,007	0,008	0,006
7,9	0,008	0,007	0,005	0,007	0,006	0,004	0,006	0,002	0,007	0,008	0,005
8,1	0,008	0,007	0,005	0,007	0,006	0,004	0,006	0,002	0,007	0,008	0,005
8,3	0,008	0,006	0,005	0,007	0,006	0,004	0,006	0,001	0,007	0,008	0,005
8,5	0,008	0,006	0,005	0,007	0,006	0,004	0,006	0,001	0,007	0,008	0,005
8,7	0,007	0,006	0,005	0,007	0,005	0,004	0,006	0,001	0,007	0,008	0,005
8,9	0,007	0,006	0,005	0,007	0,005	0,004	0,006	0,001	0,007	0,008	0,005

Voltage of defined Battery [V]	32,3
Current of defined Battery [A]	49,5
Impedance [Ω] Line Neutral	 $R_A = 0,24$ j$X_A = 0,15$ $R_N = 0,16$ j$X_N = 0,10$

5.2.5	Commutation	N/A

This test serves to determine the commutation currents, the project - specific identification and assessment of the

Commutation voltage dips according to VDE-AR-N 4100: 2020-06, 5.4.4.5 is required taking into account the short-circuit power at the point of connection.

- This check is only required for mains-controlled inverters.

5.2.6 Feed in of DC current	P

Test procedural:

The inverter must be used in the adjustment range Test1, Test2 and Test 3.

Each test point shall be held for min 5 minutes and I_{AC}, U_{AC}, $I_{dc\ in\ AC}$ of each phase has to be recorded.

Measurement of $I_{dc\ in\ AC}$ must be done according to VDE AR-N 4100:2020-06 based on DIN EN 61000-4-7 (VDE-0847-4-7) over 10 fundamental periods.

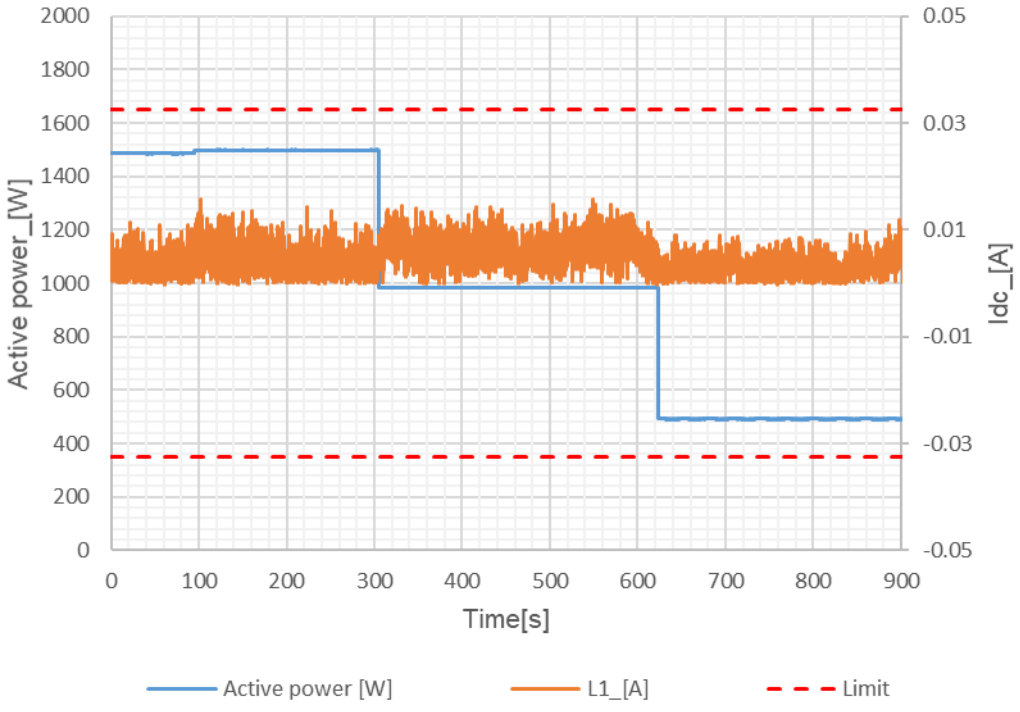
Assessment criterion:

An inverter must not feed more than 0,5% of its rated current I_r or a maximum of 20 mA (the higher value is to be selected) as direct current.

CME06-2BM250

Power Level [% of VA_r]	30% S_{Emax} to 40%S_{Emax}	60% S_{Emax} to 70%S_{Emax}	>95% S_{Emax}
AC Power [VA]	492	983	1495
AC Voltage [V]	230,15	230,26	230,36
AC Current [A]	2,138	4,270	6,490
Max. DC Current in AC [mA]	16	16	12
Max. DC Current in AC [% of Ir]	0,240	0,241	0,184
Average. DC Current in AC [mA]	4	7	3
Average. DC Current in AC [% of Ir]	0,062	0,101	0,050

Graphs for CME06-2BM250



Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.3	Evidence of symmetry behaviour of inverters	N/A

5.3.1	General	N/A
These tests serve to prove the requirements according to VDE-AR-N 4100: 2020-06, 5.5: These tests are not applicable for direct connected rotating machines! This test is necessary only for electronic inverters!		
Note: The tests of the “symmetry characteristics of three-phase inverter modules” were performed on the unit with the highest output power. Here is the maximum asymmetry given.		

5.3.2.1 Calculation of asymmetry	N/A

Test procedural:

The maximum absolute difference between the apparent powers of the three phases is determined for each of the five measurements (1-min means) in the respective operating point.

The maximum of these five values is again determined.

Assessment criterion:

The test is passed if the maximum value from the above measurements does not exceed 5 % S_{Emax} and ≤ 4600 VA.

Note:

The maximum inductive and capacitive values are specified by the manufacturer.

Setting values	cos φ = 1	--
	cos φ over-excited	--
	cos φ under-excited	--

Test:

1-min mean value	L1	L2	L3	|L1 – L2|	|L2 – L3|	|L3 – L1|
a) cos φ = 1 at 100 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
cos φ_{E60}	--					
max. asymmetry [VA]	--					
b) maximum under-excited (i) at 100 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
cos φ_{E60}	--					
max. asymmetry [VA]	--					

c) maximum over-excited (c) at 100 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
cos φ_{E60}	--					
max. asymmetry [VA]	--					
d) cos φ = 1 at 50 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
cos φ_{E60}	--					
max. asymmetry [VA]	--					
e) maximum under-excited (i) at 50 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
cos φ_{E60}	--					
max. asymmetry [VA]	--					
f) maximum over-excited (c) at 50 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
	--	--	--	--	--	--
cos φ_{E60}:	--					
max. asymmetry [VA]	--					
Limit:	≤5% S_{Emax} and ≤4600VA					

5.4	Evidence of the behaviour of the generating unit on the network

5.4.1	General (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11, 5.7.2.2 are met and to determine the values for S_{Emax} and P_{Emax})	P
Test Condition: The measurements were performed in the testing laboratory at the grid-simulator. Test voltage between 0,9 Un and 1,09 Un with ±2% Un until the test Test frequency: 50Hz ± 0,5%		
Note: If an examination is required for any other requirements, these apply to this test.		

5.4.2	**Measurement of the active power and reactive power range** (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11, 5.7.2.2 are met)	**P**

Test:

The setpoint signal must be reduced from 100% to 10% P_{rE}:

For adjustable PGUs in increments of 10% P_{rE} 1 minute must elapse after every change to the setpoint setting so that the PGU can settle at the new setpoint. Then the active power of the PGU must be measured as a 1-min mean value.

Assessment criterion:

a) for adjustable PGUs:

- no network disconnection
- the active power value does not exceed the setpoint by more than ±5% P_{rE}
- the setting time determined this way is ≤1min

Note:

The setting time is ≤ 1min. See “Graph of the setting accuracy”.

The maximum inductive and capacitive values are specified by the manufacturer.

Setting values	cos φ = 1	1,0
	cos φ over-excited:	0,95
	cos φ under-excited:	0,95

CME06-2BM250				
600s mean value	U [V]	$P_{Emax600\ c)}$ [W]	$S_{Emax600\ c)}$ [VA]	cos $\varphi_{Emax600}$ [-]
0,90 U_n at 100% P_{Emax}				
cos φ = 1	207,80	1511	1515	0,997
cos φ max. over-excited	206,72	1433	1505	0,952
0,95 U_n at 100% P_{Emax}				
cos φ max. under-excited	218,55	1417	1494	0,949
1,0 U_n at 100% P_{Emax}				
cos φ = 1	230,60	1492	1497	0,996
cos φ max. under-excited	229,77	1417	1493	0,949
cos φ max. over-excited	229,76	1432	1505	0,952
1,05 U_n at 100% P_{Emax}				
cos φ max. over-excited	241,27	1433	1507	0,951
1,09 U_n at 100% P_{Emax}				
cos φ = 1	251,45	1495	1502	0,995
cos φ max. under-excited	250,49	1417	1493	0,950

$S_{Emax600}$ and $P_{Emax\ 600}$	
$S_{Emax600}$= max ($S_{Emax600\ a)}$, $S_{Emax600\ b)}$, $S_{Emax600\ c)}$) [VA]	1515
$P_{Emax\ 600}$= max ($P_{Emax600\ a)}$, $P_{Emax600\ b)}$, $P_{Emax600\ c)}$) [W]	1511

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.4.3 Measurement of setting accuracy	P

Test procedural:

The P setpoint was set by RS485 port.

(The active power can be set between 100%Pn and 10%Pn with a step size of 10%Pn)

Assessment:

- no network disconnection occurs and
- the active power value does not deviate by more than 5% P_{rE} from the target value.

Note:

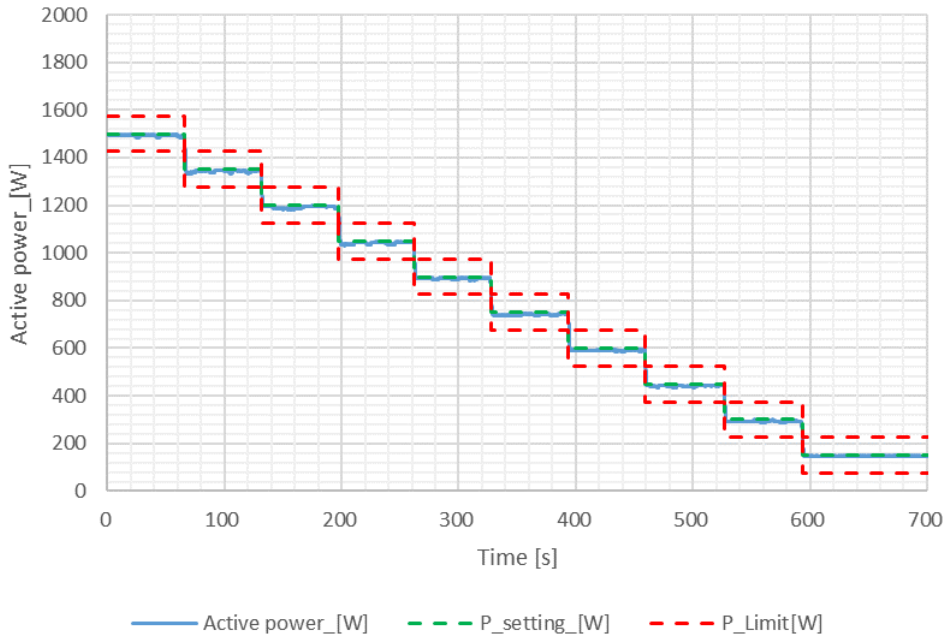
The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

CME06-2BM250

% of rated capability	Setpoint		Measured value		Deviation (P_{meas} - P_{set})		Limit ΔP_{E60} in %
	[W]	[%P_n]	[W]	[%Pn]	[W]	[%P_n]	
100	1500	100,0	1493	99,56	-7	-0,44	≤ ±5% of P_{rE}
90	1350	90,0	1343	89,53	-7	-0,47	
80	1200	80,0	1192	79,47	-8	-0,53	
70	1050	70,0	1042	69,47	-8	-0,53	
60	900	60,0	893	59,55	-7	-0,45	
50	750	50,0	741	49,41	-9	-0,59	
40	600	40,0	592	39,48	-8	-0,52	
30	450	30,0	441	29,43	-9	-0,57	
20	300	20,0	293	19,56	-7	-0,44	
10	150	10,0	148	9,88	-2	-0,12	

Overall maximum active power deviation to set point [%P_n]:	0,59

Graph of the setting accuracy: CME06-2BM250



5.4.3.4 Measurement of the power gradient	P

Test procedural:

The P setpoint was set by RS485 port.
The measurement of the power gradient takes place:

- Via a setpoint change from 100% to 5% of the rated effective power PrE at time t0. If the technical performance is >5%, this should be specified.
- Via a setpoint change from 5% to 100% of the rated effective power PrE at time t0. Is the technical Performance >5%, this should be specified.

Assessment:

- no network disconnection occurs and
- the power gradients determined in accordance with 5.4.3.4 shall not fall below 0.33 % P_{rE} and shall not exceed 0.66 % P_{rE}.
- The first gradient is to be formed 30 s after setting the setpoint jump.
- The formation of gradients is terminated 30 s before reaching the stationary final value.

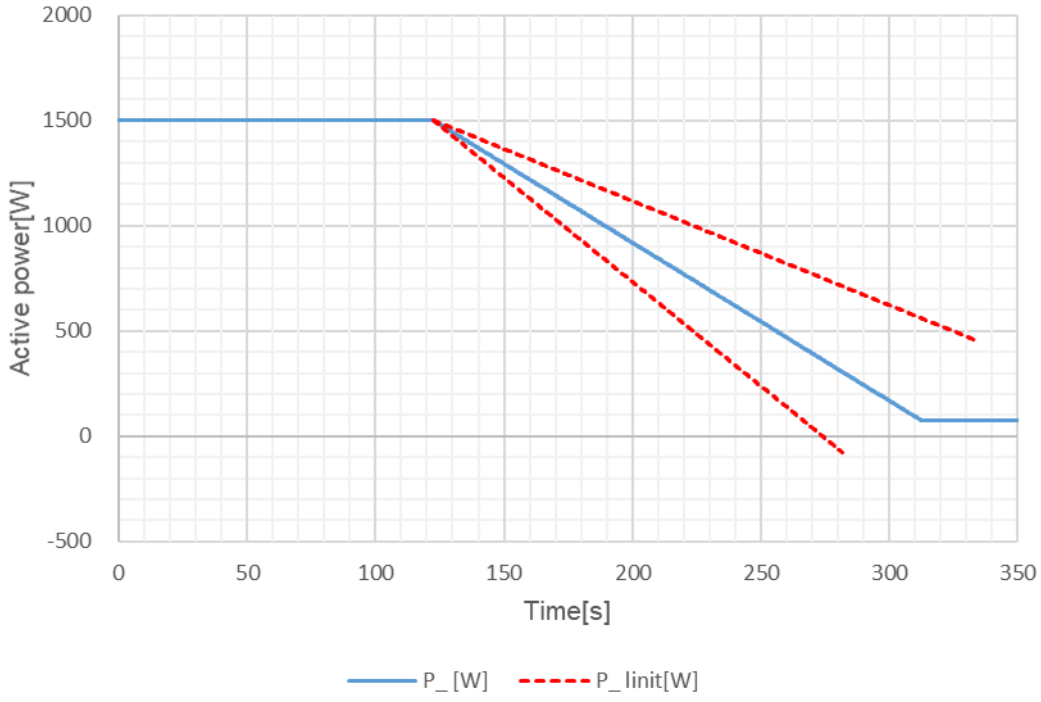
Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

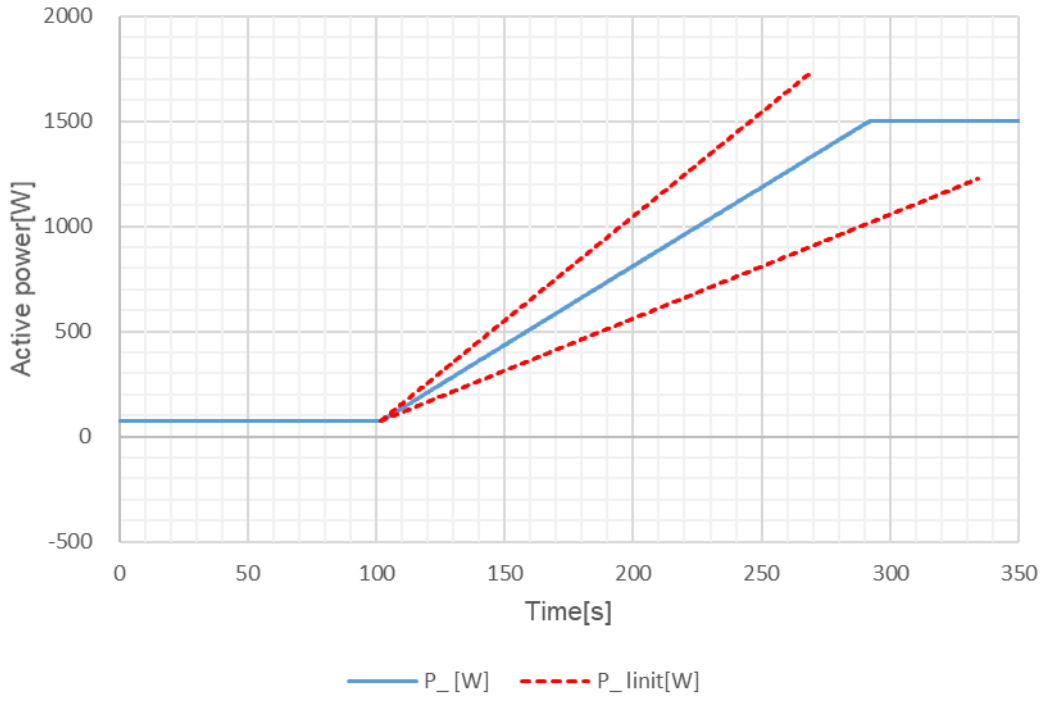
Verification the setting Power gradient change from 100%$P_{rE\ to}$ 5%P_{rE} at CME06-2BM250

$P_{\_setting}$ point step	Setting value	Measured value
$P_{before\ power\ change}$ = 100% P_{rE} ± 5% P_{rE}	100,0% P_{rE}	100,12% P_{rE}
Power gradient (during power change):	0,5 %P_{rE} / s	0,50%P_{rE} / s
$P_{after\ power\ change}$ = 5% P_{rE} ± 5% P_{rE}	5,0% P_{rE}	5,02 % P_{rE}

Graph of the gradient 100% to 5% P_{rE}



5.4.3.4 Measurement of the power gradient		P
Verification the setting Power gradient change from 5% to 100% at CME06-2BM250		
$P_{\_setting}$ point step	Setting value	Measured value
$P_{before\ power\ change}$ = 5% P_{rE} ± 5% P_{rE}	5,0% P_{rE}	5,01% P_{rE}
Power gradient (during power change):	0,5 %P_{rE} / s	0,50%P_{rE} / s
$P_{after\ power\ change}$ = 100% P_{rE} ± 5% P_{rE}	100,0 % P_{rE}	99,98 % P_{rE}
Limit of power gradient [%P_{rE} / s]:	0,33 to 0,66	
Inverter remains in operation?	☒ yes	
	☐ no	
Graph of the gradient 5% to 100% PrE		



5.4.3.5 Measurement priority interfaces / energy management system	P

Test procedural:

Test 1 (Measurement priority interfaces)

Test 2 (logical interface):

Test steps

a) the PGU is operated with no less than 90% P_{rE};
b) the change of state of the logic signal.

Assessment:

Test 1:

a) The lowest setpoint is always given priority
b) the setpoint at the interface programmed for the NSM is never exceeded

Test 2:

c) during the examination of the logical interface (input port), the active power feed of the EZE was completely terminated within a maximum of 5 s after the state change of the logical signal.

Note:

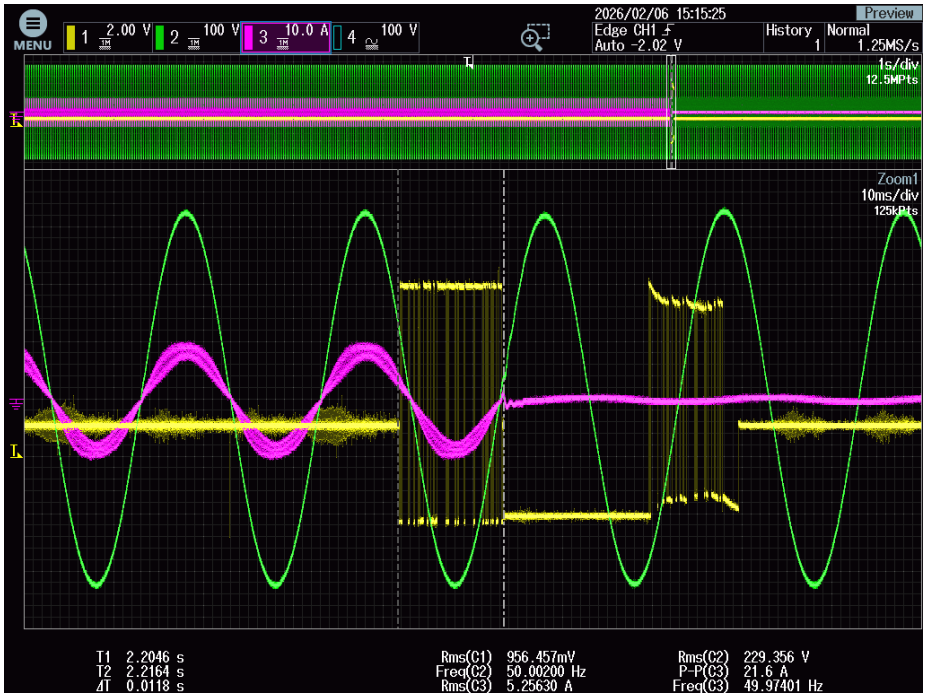
The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Test results:

Test1: The unit only provides two interfaces for active power reduction.

Test 1 (Interface low priority Interface Wi-Fi &Bluetooth	Interface Wi-Fi & Bluetooth	50%	50,01%
	Interface RS485	80%	
Test 2 (Interface low priority Interface RS485)	Interface Wi-Fi & Bluetooth	70%	60,05%
	Interface RS485	60%	

Test 2: Use logical interface to test the result of stopping active power output.



There is an abnormal emergency stop button on the front of **CME06-2BM250**. After being photographed, the machine stops output within 5 seconds. In addition, there is a DATA PORT in the machine. When the port is enabled, the machine will stop output within 5 seconds.

The external device interface diagram is shown below:

PIN NO	PIN	Connected to RS485 tool	Baud rate
1	DATA_RS485_A	RS485_A	38400
2	DATA_RS485_B	RS485_B	38400

The A of the RS485 tool connects to the 4pin of the DATA port on the fusioncube
The B of the RS485 tool connects to the 3pin of the DATA port on the fusioncube
Communication baud rate 38400

close	Message(H):68 01 AA 02 00 00 01 94 F4 16
open	Message(H):68 01 AA 02 00 00 00 b5 E4 16

In the working process of the energy storage integrated machine, the computer sends the close command through the RS485 tool, and the integrated machine will disconnect the output within 3 seconds. Send the open command, and the integrated machine will resume output in 3 seconds

5.4.4 Active power feed-in for PGUs at overfrequency (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met)	N/A

Test cycle for adjustable PGUs:

Test 1: CME06-2BM250

Test point: No.	Test point: [Hz]	Expected active power output [% of P_{Emax}]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60} [% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** ΔP_{E60} in %	Available DC-power [%]:
Measurement: 100% P_{Emax}; start frequency 50,20Hz; droop s setting = 5% (40% P_{ref}/Hz)									
a)	50,00	100	--	--	--	--	--	≤ ±10% of P_{Emax}	100
b)	50,25	98	--	--	--	--	--		
c)	50,70	80	--	--	--	--	--		
d)	51,40	52	--	--	--	--	--		
e)	50,70	80	--	--	--	--	--		
f)	50,25	98	--	--	--	--	--		
g)	50,00	100	--	--	--	--	--		
h)	51,65	0	--	--	--	--	--		
i)	50,15	0	--	--	--	--	--		
j)	50,00	100	--	--	--	--	--		

Frequency Step	Response time [s]	Settling time [s]
b) → c)	--	--
c) → d)	--	--
d) → e)	--	--
e) → f)	--	--

Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0	--

Test 2: CME06-2BM250

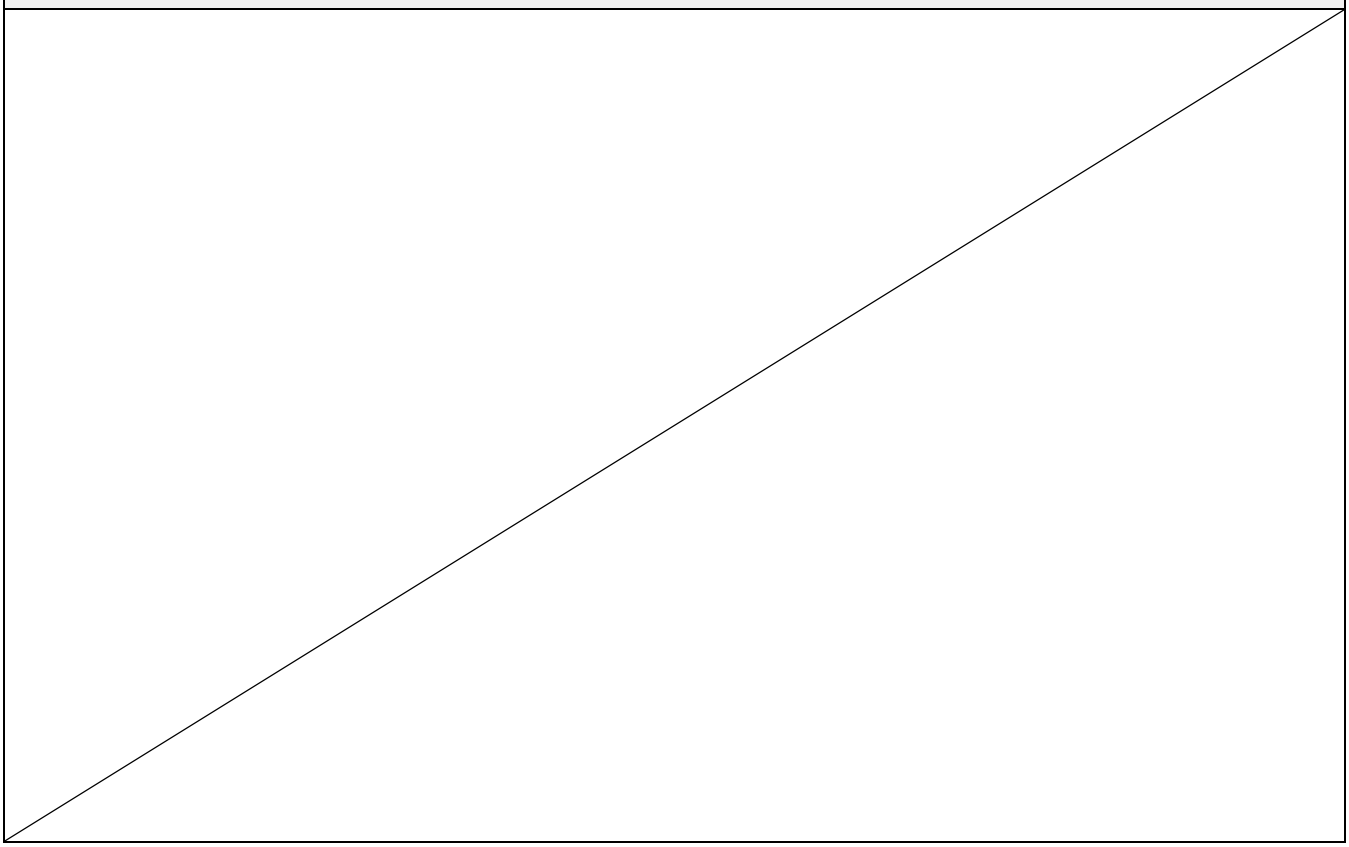
1-min mean value: No.	1-min mean value: [Hz]	Expected active power output [% of P_{Emax}]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60}[% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** ΔP_{E60} in %	Available DC-power [%]:
Measurement: 60% P_{Emax}; start frequency 50,50Hz; droop s setting = 12% (16,67% P_{ref}/Hz)									
a)	50,00	60	--	--	--	--	--	≤ ±10% of P_{Emax}	100
b)	50,40	60	--	--	--	--	--		
c)	50,70	58	--	--	--	--	--		
d)	51,40	51	--	--	--	--	--		
e)	50,70	58	--	--	--	--	--		
f)	50,40	60 – 100	--	--	--	--	--		
g)	50,00	100	--	--	--	--	--		

Frequency Step	Response time [s]	Settling time [s]
b) → c)	--	--
c) → d)	--	--
d) → e)	--	--
e) → f)	--	--

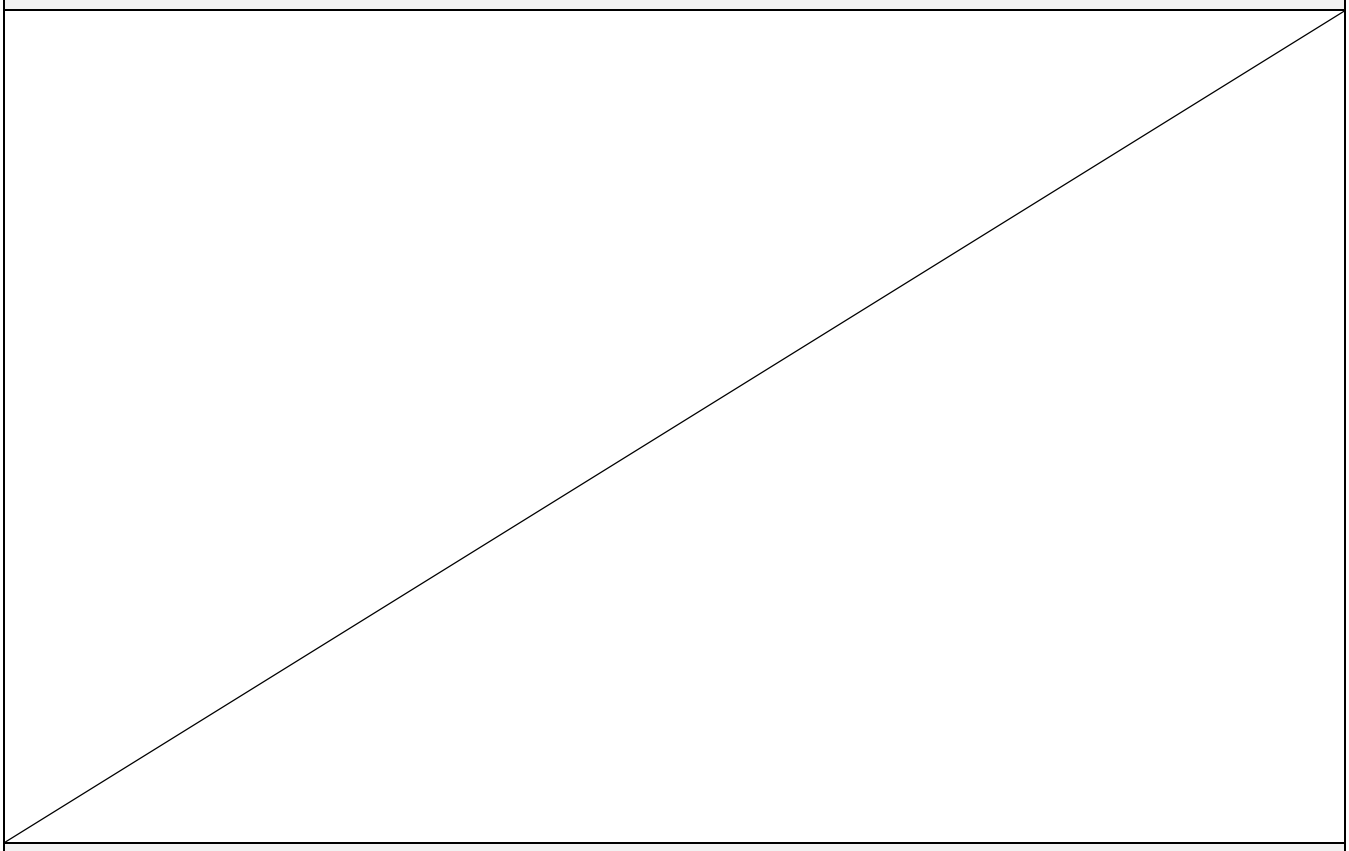
Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0	--

DC setting values:	
PV-curve simulated according to	
Voltage of defined MPP [V]	--
Current of defined MPP [A]	--
FFU of PV curve [1]	--
$P_{DC\text{-}Sum}$ [W]	--

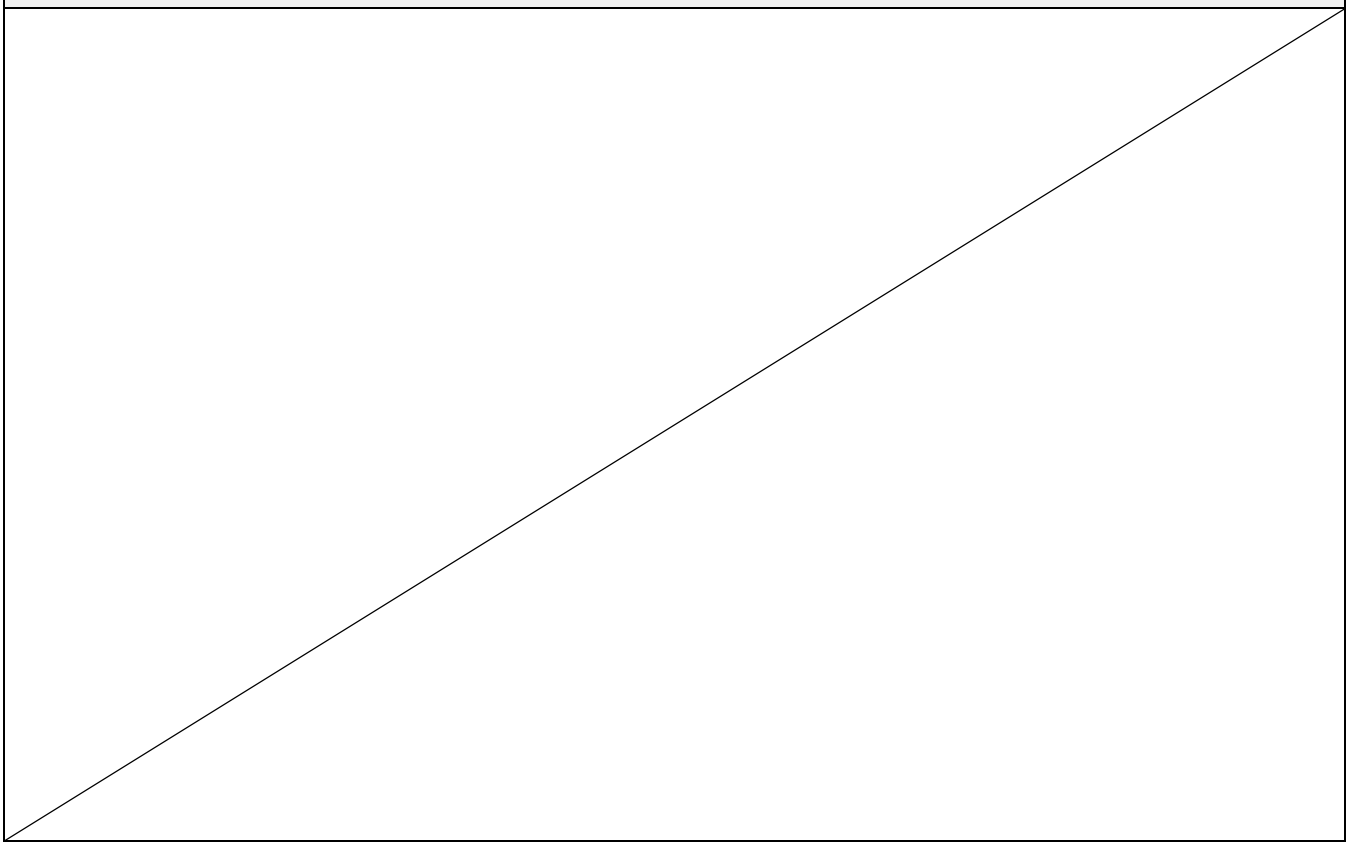
Graph Test 1@ 100% P_{Emax}



Gradient Test 1



Graph Test2 @ 60% P_{Emax}



Assessment criterion:

The test is regarded as passed:

a) for controllable PGU if:

- The active power reduces between measuring points 5.4.4.1 a) to g) and j), the expected active power output, after settling, adjusts with a deviation ≤ ±10% P_{Emax}.

b) for conditionally adjustable PGU, if:

- they behave as described in a) inside their control range and
- outside the control range, the power supplied when leaving the control range remains constant until it is switched off
- the connection time in j) and where appropriate in g) corresponds to the manufacturer's information on the random number generator;

NOTE: The Uniform distribution of the disconnection frequency in maximum increments of 0,1 Hz between the end of the control range (at least 50,2 Hz) and 51,5 Hz shall be proofed by a manufacturer's declaration.

c) for non-adjustable PGU, if

- a disconnection takes place between 50,2 Hz and 51,5 Hz;
- the connection time in j) and where appropriate in g) corresponds to the manufacturer's information on the random number generator;

NOTE The Uniform distribution of the disconnection frequency in maximum increments of 0,1 Hz between 50,2 In the measurement points h) and i) shall no active power be given.

- The initial time delay T_V of the frequency-dependent adaptation of the active power output ≤ 2 s.
- The response time of the adaptation of the active power output is a maximum of 8 s (type 1 units and type 2 units with rotating machines) or 2 s (all other type 2 units)
- the settling time of the adaptation of the active power output is a maximum time of 30 s (for type 1 units and for type 2 units with rotating machines) or respectively a maximum time of 20 s (for all other generation units type 2) and
- The connection time at point j) is at least 60 s and the power is then increased with a gradient of ≤ 10% P_{Emax}/min.
- In the case of generating units with combustion engines or gas turbines, if the criteria for response time and settling time are not met, the test shall be passed, even if the adaptation of active power output occurs with a power gradient of at least 66% P_{Emax} per min (corresponding to 1,11% P_{Emax} per s).

Hz and 51,5 Hz shall be proofed by a manufacturer's declaration.

d) for linear generators with S_{Emax} ≤ 4,6 kVA,

- if they disconnect from the mains at a frequency ≥ 50,2 Hz and their maximum upper frequency limit (as specified by the manufacturer), but at the latest when they exceed 51,5 Hz.
- the connection time in j) and where appropriate in g) corresponds to the manufacturer's information on the random number generator;

Subsequently no more resynchronisation/active power feed-in is permitted, also while the frequency 5.4.4.1 i) is maintained (i.e., no running on the characteristic curve as previously tested in a) at g).

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.4.5	Active power feed-in of Storage systems for overfrequency (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met)	P

Test cycle for adjustable PGUs:

Test 1:

1-min mean value: No.	1-min mean value: [Hz]	Expected active power output [% of P_{Emax}]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60} [% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** $\lvert\Delta P_{E60}\rvert$ [%P_{Emax}]	SOC [%]*
Measurement: 100% P_{Emax}; start frequency 50,20Hz; droop s setting = 5% (40% P_{Emax}/Hz)									
a)	50,00	100	50,00	1500	1502	100,13	0,13	≤ 10	41
b)	50,25	98	50,25	1470	1481	98,70	0,70		40
c)	50,70	80	50,70	1200	1206	80,42	0,42		39
d)	51,40	52	51,40	780	786	52,40	0,40		38
e)	50,70	80	50,70	1200	1199	79,92	-0,08		37
f)	50,25	98	50,25	1470	1467	97,81	-0,19		37
g)	50,00	100	50,00	1500	1500	100,03	0,03		35
h)	51,65	0	51,65	0	0	0,01	0,01		34
i)	50,15	0	50,15	0	0	0,02	0,02		34
j)	50,00	100	50,00	1500	1500	100,01	0,01		26

Frequency Step	Response time [s]	Settling time [s]
b) → c)	0,2	0,4
c) → d)	0,2	1,0
d) → e)	0,4	1,0
e) → f)	0,4	1,6

Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0	0,2

Test 2:

1-min mean value: No.	1-min mean value: [Hz]	Expected active power output [% of $P_{Emax\ x}$]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60} [% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** $\lvert\Delta P_{E60}\rvert$ [%P_{Emax}]	SOC [%]*
Measurement: 60% P_{Emax}; start frequency 50,50Hz; droop s setting = 5% (40% P_{Emax}/Hz)									
a)	50,00	60	50,00	900	901	60,06	0,06	≤ 10	53
b)	50,40	60	50,40	900	900	60,01	0,01		53
c)	50,70	52	50,70	780	782	52,11	0,11		52
d)	51,40	24	51,40	360	363	24,23	0,23		51
e)	50,70	52	50,70	780	779	51,93	-0,07		51
f)	50,10	60 - 100	50,40	1500	1498	99,89	-0,11		45
g)	50,00	100	50,00	1500	1500	99,99	-0,01		44

Frequency Step	Response time [s]	Settling time [s]
b) → c)	0,2	1,0
c) → d)	0,4	1,0
d) → e)	0,4	0,6
e) → f)	0,2	0,4

Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0	0,2

DC setting values:	
PV-curve simulated according to	
Voltage of defined MPP [V]	--
Current of defined MPP [A]	--
FFU of PV curve [1]	--
DC Battery (Source) input current [A]	49,5
DC Battery (Source) input voltage [V]	32,3
$P_{DC\text{-}Sum}$ [W]	1600

Assessment criterion:

The test is regarded as passed:

The active power reduces between measuring points in clause 5.4.5.1 a) to g) and j), the expected active power output, after settling, adjusts with a deviation ≤ ±10% P_{Emax}. Deviations arising from the fact that the maximum discharge capacity is less than P_{Emax} are permissible. In the measuring points h) and i) no active power may be delivered.

The initial time delay T_V of the frequency-dependent adaptation of the active power output ≤ 2 s.

The response time of the adaptation of the active power output is a maximum of 1s

the settling time of the adaptation of the active power output is a maximum time of 30 s (for type 1 units and for type 2 units with rotating machines) or respectively a maximum time of 20 s

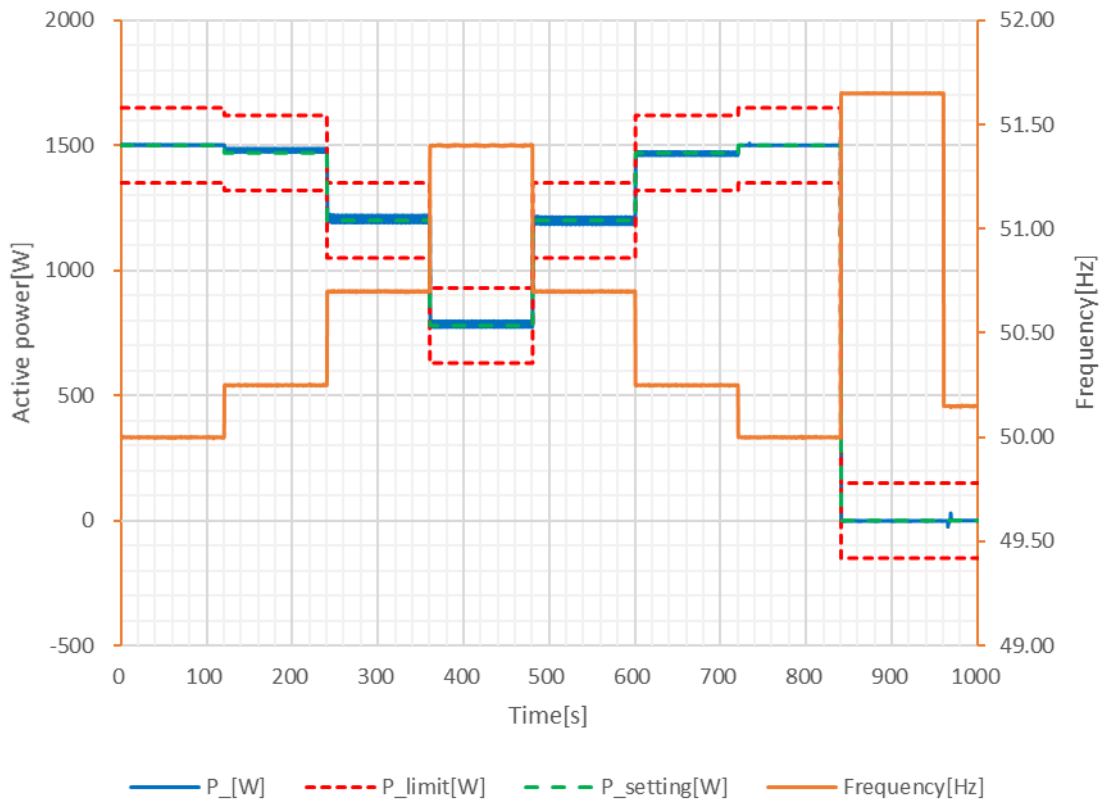
- The connection time at point j) is at least 60 s and the power is then increased with a gradient of ≤ 10% P_{Emax} /min.

Note:

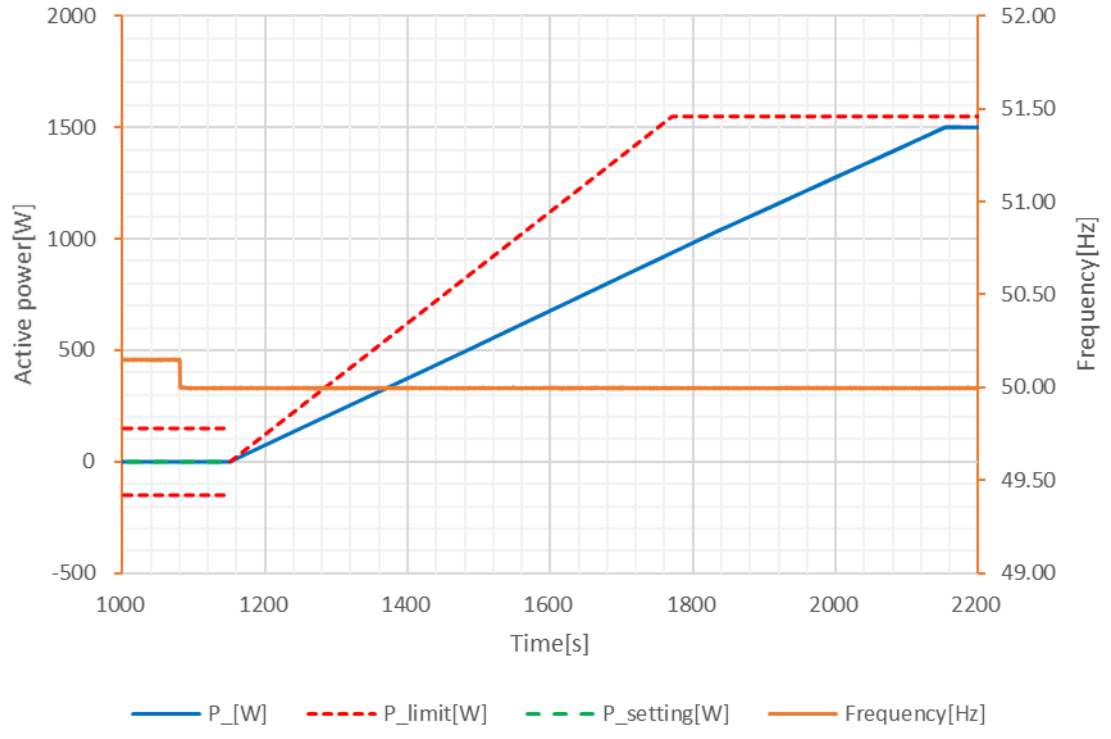
* Results recorded at 1 minute after the transient process of power change completed.

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

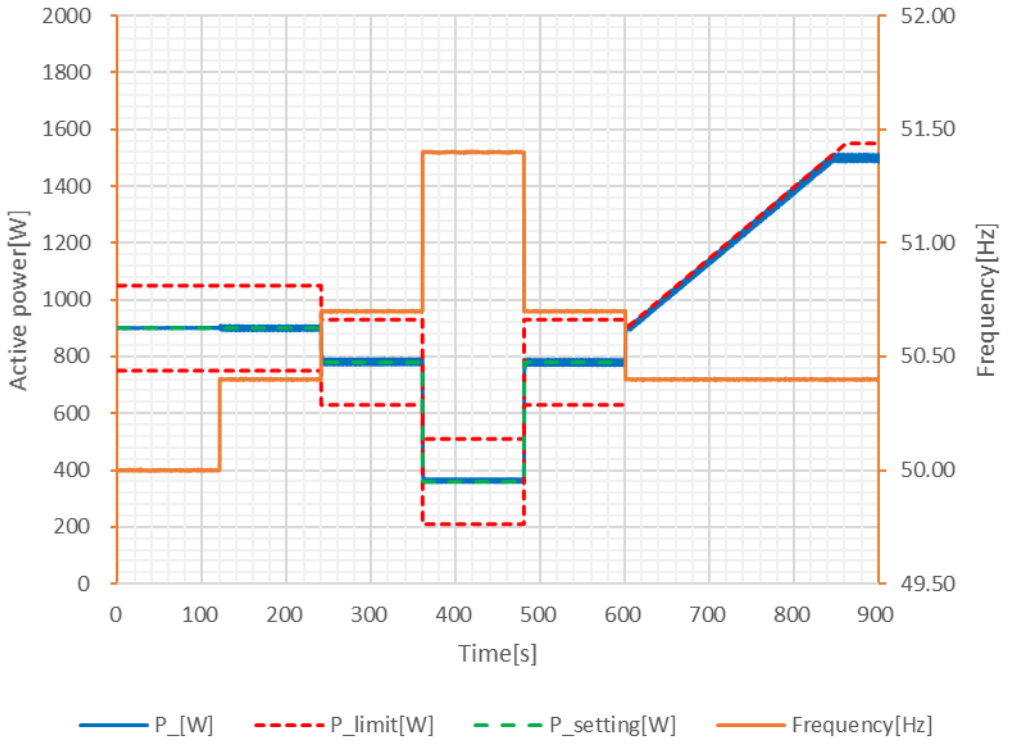
Graph Test 1@ 100% P_{Emax}



Gradient Test 1



Graph Test2 @ 60% P_{Emax}



5.4.6	**Active power feed-in for PGUs at underfrequency** (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met) (Not for DC-coupled Storage systems)	**N/A**

Test cycle for adjustable PGUs:

Test 1:CME06-2BM250

1-min mean value: No.	1-min mean value: [Hz]	Expected active power output [% of P_{Emax}]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60} [% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** ΔP_{E60} in %	Available DC-power [%]:
Measurement: 10% P_{Emax}; start frequency 49,80Hz; droop s setting = 5% (40% P_{ref}/Hz)									
a)	50,00	10	--	--	--	--	--	≤ ±10% of P_{Emax}	100
b)	49,75	12	--	--	--	--	--		
c)	48,80	50	--	--	--	--	--		
d)	47,60	98	--	--	--	--	--		
e)	48,80	50	--	--	--	--	--		
f)	49,75	12	--	--	--	--	--		
g)	50,00	10	--	--	--	--	--		
h)	47,35	0	--	--	--	--	--		
i)	47,40	0	--	--	--	--	--		
j)	50,00	10	--	--	--	--	--		

Frequency Step	**Response time [s]**	**Settling time [s]**
b) → c)	--	--
c) → d)	--	--
d) → e)	--	--
e) → f)	--	--

Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0,0	--

Test 2: CME06-2BM250

1-min mean value: No.	1-min mean value: [Hz]	Expected active power output [% of P_{Emax}]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60} [% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** ΔP_{E60} in %	Available DC-power [%]:
Measurement: 60% P_{Emax}; start frequency 49,80Hz; droop s setting = 5% (40% P_{ref}/Hz)									
a)	50,00	60	--	--	--	--	--	≤ ±10% of P_{Emax}	100
b)	49,75	62	--	--	--	--	--		
c)	49,20	84	--	--	--	--	--		
d)	48,80	100	--	--	--	--	--		
e)	49,20	84	--	--	--	--	--		
f)	49,85	60	--	--	--	--	--		

5.4.6	Active power feed-in for PGUs at underfrequency (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met) (Not for DC-coupled Storage systems)	N/A

g)	50,00	60	--	--	--	--	--		

Frequency Step	Response time [s]	Settling time [s]
b) → c)	--	--
c) → d)	--	--
d) → e)	--	--
e) → f)	--	--

Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0,0	--

DC setting values:	
PV-curve simulated according to	
Voltage of defined MPP [V]	--
Current of defined MPP [A]	--
FFU of PV curve [1]	--
$P_{DC\text{-}Sum}$ [W]	--

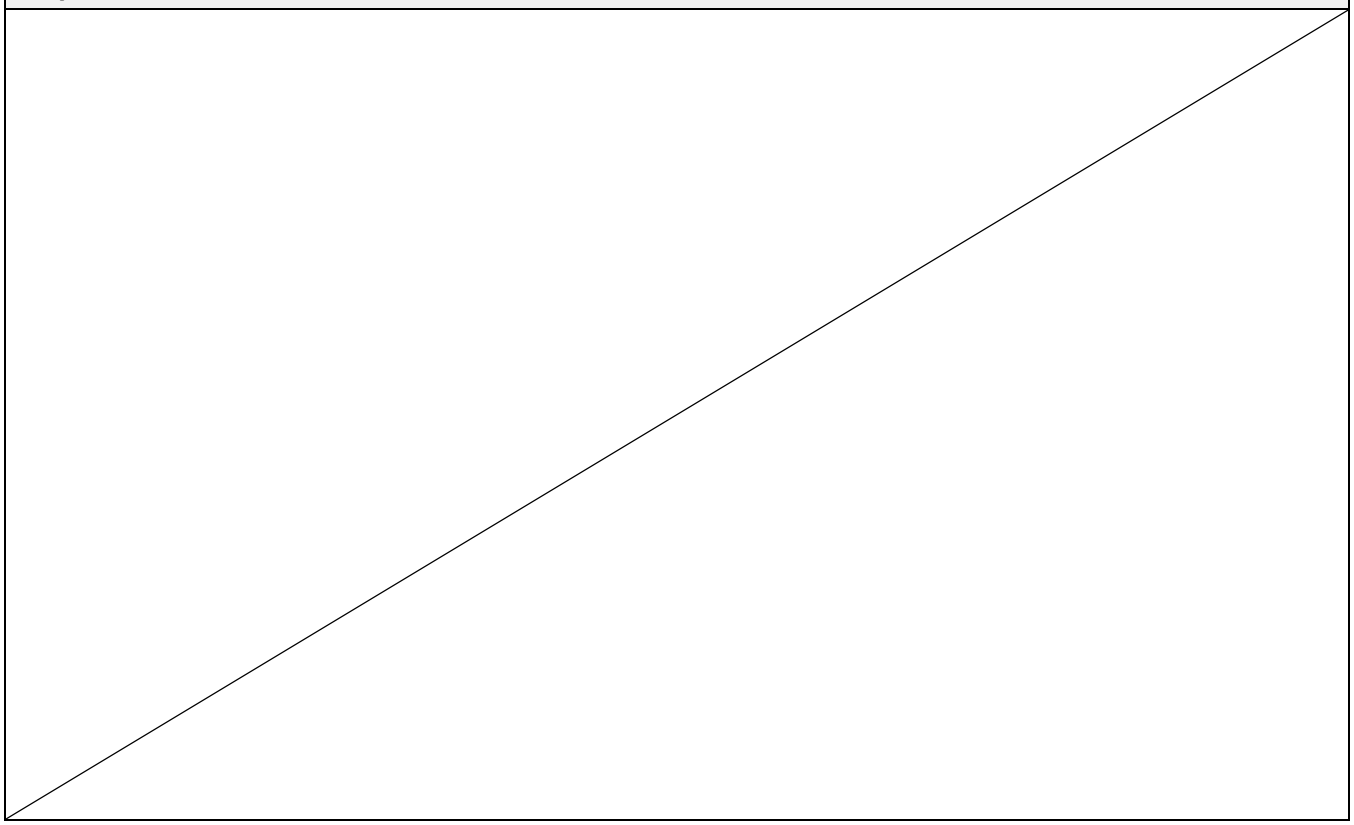
5.4.6	**Active power feed-in for PGUs at underfrequency** (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met) (Not for DC-coupled Storage systems)	**N/A**

Graph Test 1@ 10% P_{Emax}

Gradient Test 1

5.4.6	**Active power feed-in for PGUs at underfrequency** (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met) (Not for DC-coupled Storage systems)	**N/A**

Graph Test2 @ 60% P_{Emax}



5.4.6	**Active power feed-in for PGUs at underfrequency** (These tests are designed to provide evidence that the requirements of VDE-AR-N 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met) (Not for DC-coupled Storage systems)	**N/A**

Assessment criterion:

The test is regarded as passed:

a) for controllable PGU if:

- The active power reduces between measuring points 5.4.4.1 a) to g) and j), the expected active power output, after settling, adjusts with a deviation ≤ ±10% P_{Emax}. Deviations according to VDE-AR-N 4105: 2018-11, 5.7.4.3, Figure 13 and due to the technical restrictions described are permissible. In the measuring points h) and i) no active power may be delivered,
- The initial time delay T_V of the frequency-dependent adaptation of the active power output ≤ 2 s.
- The response time of the adaptation of the active power output is a maximum of 8 s (type 1 units and type 2 units with rotating machines) or 2 s (all other type 2 units)
- the settling time of the adaptation of the active power output is a maximum time of 30 s (for type 1 units and for type 2 units with rotating machines) or respectively a maximum time of 20 s (for all other generation units type 2) and
- The connection time at point j) is at least 60 s and the power is then increased with a gradient of ≤ 10% P_{Emax} / min.
- In the case of generating units with combustion engines or gas turbines, if the criteria for response time and settling time are not met, the test shall be passed, even if the adaptation of active power output occurs with a power gradient of at least 66% P_{Emax} per min (corresponding to 1,11% P_{Emax} per s).

b) for conditionally adjustable PGU, if:

- they behave as descripted in a) inside their control range and
- no disconnection takes place between 49,8 Hz and 47,5 Hz;
- the connection time in j) corresponds to the manufacturer's information on the random number generator;

NOTE: The Uniform distribution of the disconnection frequency in maximum increments of 0,1 Hz between the end of the control range (at least 50,2 Hz) and 51,5 Hz shall be proofed by a manufacturer's declaration.

c) for non-adjustable PGU, if

- no disconnection takes place between 49,8 Hz and 47,5 Hz;
- the connection time in j) corresponds to the manufacturer's information on the random number generator;

NOTE The Uniform distribution of the disconnection frequency in maximum increments of 0,1 Hz between 50,2 Hz and 51.5 Hz shall be proofed by a manufacturer's declaration.

d) for linear generators with S_{Emax} ≤ 4,6 kVA,

- if they disconnect from the mains at a frequency ≤ 49,8 Hz and their maximum upper frequency limit (as specified by the manufacturer), but at the latest when they exceed 47,5 Hz.

The connection time in j) corresponds to the manufacturer's information on the random number generator;

Subsequently no more resynchronization/active power feed-in is permitted, also while the frequency 5.4.4.1 i) is maintained (i.e no running on the characteristic curve as previously tested in a) at g).

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.4.7	Active power feed-in for Storage systems at underfrequency (These tests are designed to provide evidence that the requirements of VDE-AR-N: 4105:2018-11 5.7.4.3. and VDE-AR-N 4105:2018-11 8.3.1. are met)	P

Test cycle for adjustable PGUs:

Test 1:

1-min mean value: No.	1-min mean value: [Hz]	Expected active power output [% of P_{Emax}]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60} [% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** $\lvert\Delta P_{E60}\rvert$ [%P_{Emax}]	SOC [%] *	Available active power in charging or discharging mode [%P_{Emax}]
Measurement: -100% P_{Emax}; start frequency 49,80Hz; droop s setting = 2% (100% P_{Emax}/Hz)										
a)	50,00	-100	50,00	-1500	-1492	-99,47	0,53	≤ 10	44	-110
b)	49,75	-95	49,75	-1425	-1424	-94,93	0,07		45	-110
c)	48,80	0	48,80	0	-39	-2,60	-2,60		46	+110
d)	47,60	100	47,60	1500	1474	98,27	-1,73		46	+110
e)	48,80	0	48,80	0	21	1,40	1,40		45	+110
f)	49,85	-100	49,85	-1500	-1473	-98,20	1,80		45	-110
g)	50,00	-100	50,00	-1500	-1488	-99,20	0,80		46	-110
h)	47,35	0	47,35	0	-8	-0,53	-0,53		47	+110
i)	47,40	0	47,40	0	-1	-0,07	-0,07		47	+110
j)	50,00	-100	50,00	-1500	-1490	-99,33	0,67		55	-110

Frequency Step	Response time [s]	Settling time [s]
b) → c)	1,0	2,5
c) → d)	0,8	0,9
d) → e)	1,0	1,9
e) → f)	0,8	0,9

Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0	0,4

Test 2:

1-min mean value: No.	1-min mean value: [Hz]	Expected active power output [% of P_{Emax}]:	Frequency [Hz]:	$P_{setpoint}$ [W]:	P_{E60} [W]:	P_{E60} [% of P_{Emax}]:	ΔP_{E60} [%]	**Limit** $\lvert\Delta P_{E60}\rvert$ [%P_{Emax}]	SOC [%] *	Available active power in charging or discharging mode [%P_{Emax}]
Measurement: 10% P_{Emax}; start frequency 49,80Hz; droop s setting = 2% (100% P_{Emax}/Hz)										
a)	50,00	10	50,00	150	150	10,00	0,00	≤ 10	55	+110
b)	49,75	15	49,75	225	197	13,13	-1,87		55	+110
c)	48,80	100	48,80	1500	1480	98,67	-1,33		55	+110

d)	47,60	100	47,60	1500	1491	99,40	-0,60		53	+110
e)	48,80	100	48,80	1500	1489	99,27	-0,73		52	+110
f)	49,85	10	49,85	150	166	11,07	1,07		51	+110
g)	50,00	10	50,00	150	153	10,20	0,20		51	+110

Frequency Step	Response time [s]	Settling time [s]
b) → c)	0,8	0,9
c) → d)	0,2	0,4
d) → e)	0,2	0,4
e) → f)	0,9	1,3

Initial time delay T_V setting value [s]:	Initial time delay T_V measured value (Determined during frequency step a) → b)) [s]:
0	0,5

DC setting values:	
PV-curve simulated according to	
Voltage of defined MPP [V]	--
Current of defined MPP [A]	--
FFU of PV curve [1]	--
DC Battery (Source) input current [A]	49,5
DC Battery (Source) input voltage [V]	32,3
$P_{DC\text{-}Sum}$ [W]	1600

Assessment criterion:

The test is regarded as passed if the Storage system:

- The active power reduces between measuring points 5.4.7.1 a) and j), the expected active power output, after settling, adjusts with a deviation ≤ ±10% P_{Emax}. Deviations arising from the fact that the maximum discharge capacity is less than P_{Emax} are permissible. In the measuring points h) and i) no active power may be delivered.
- The initial time delay T_V of the frequency-dependent adaptation of the active power output ≤2s.
- The response time of the adaptation of the active power output /-consumption is a maximum of 1s and;
- the settling time of the adaptation of the active power output /-consumption is a maximum time of 20s
- The connection time at point j) is at least 60s and the power is then increased with a gradient of ≤ ±10% P_{Emax} /min.

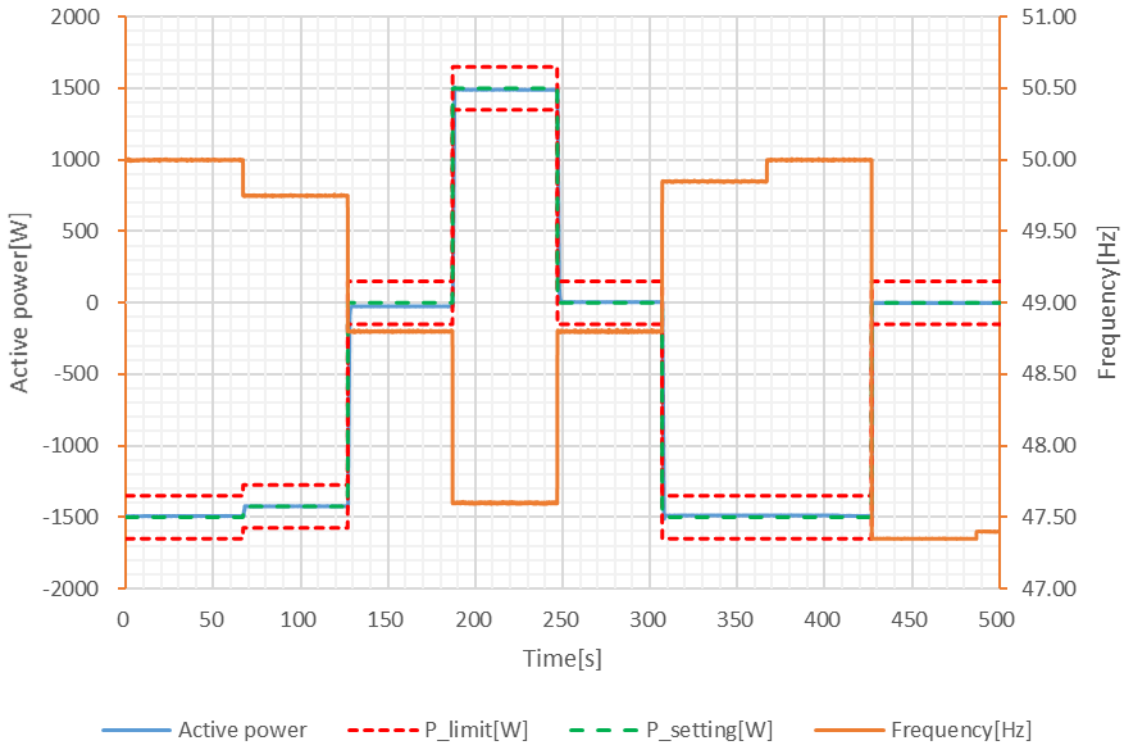
Note:

* Results recorded at 1 minute after the transient process of power change completed.

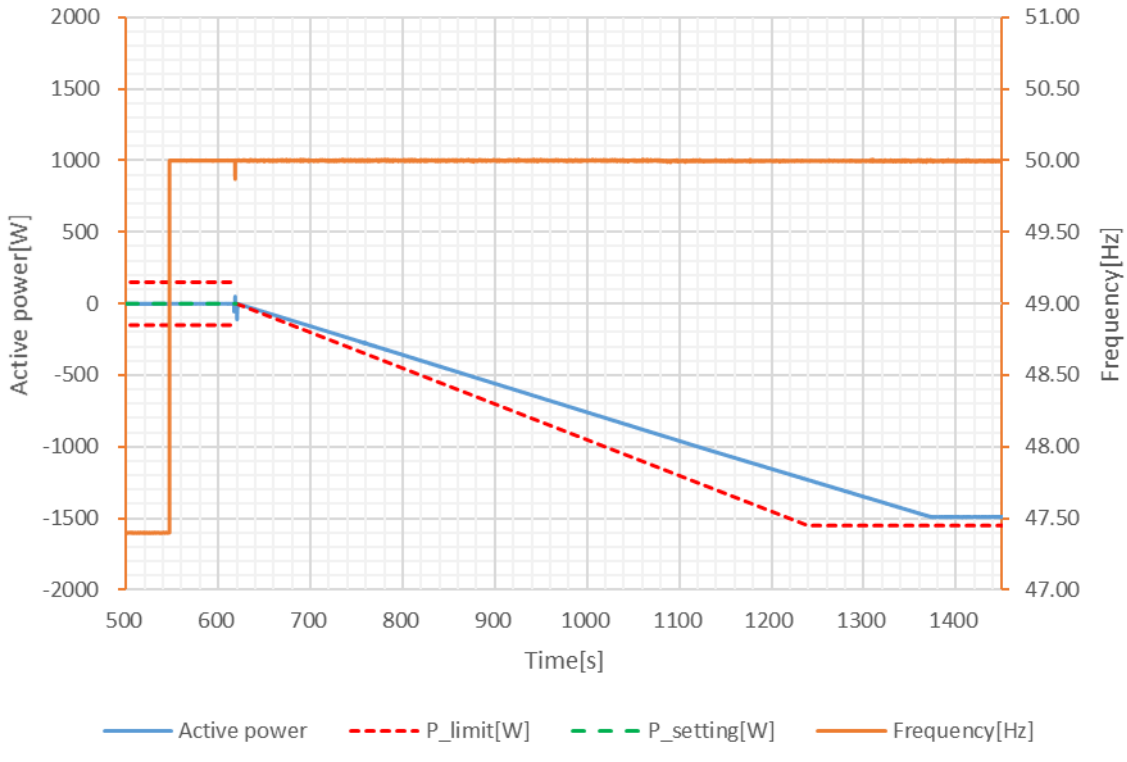
Available active power in charging mode has a negative sign (“-“), while in discharging mode a positive sign (“+”).

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

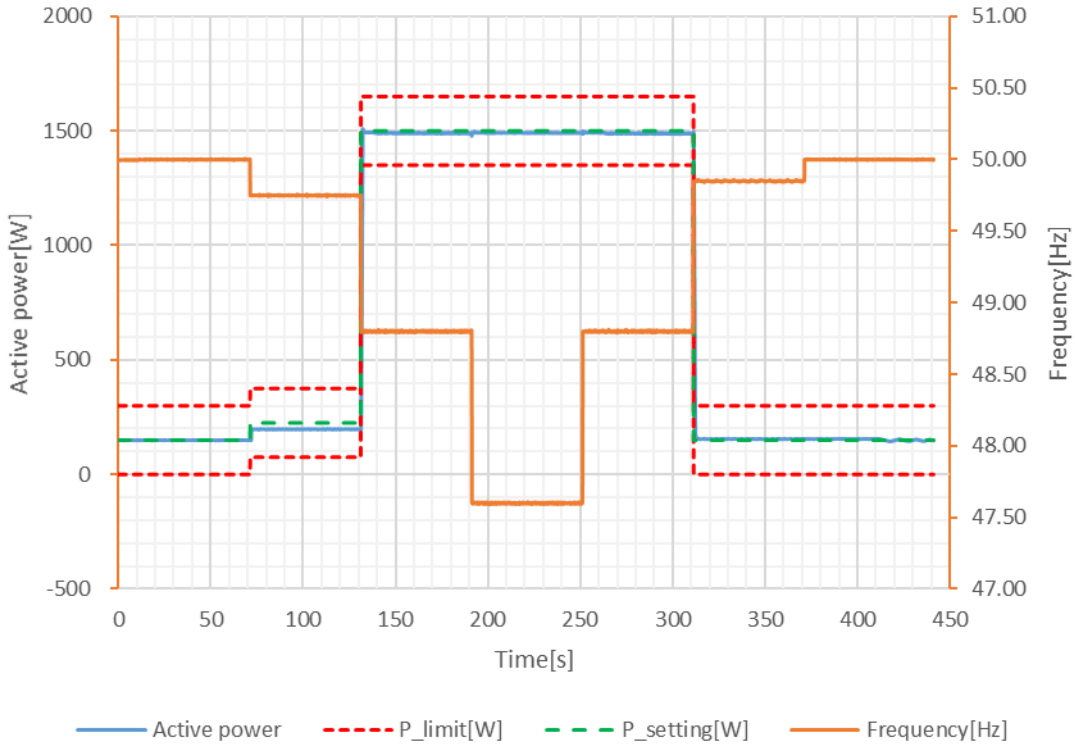
Graph Test 1@ 100% P_{Emax}



Gradient Test 1



Graph Test2 @ 10% P_{Emax}



5.4.8 Static voltage stability / reactive power supply

The test serves as verification of the reactive power mode according to VD-AR-N 4105: 2018-11, 5.7.2 of the PGU in normal operation.

5.4.8.2 Tests of the Reactive power / cos φ setting accuracy **P**

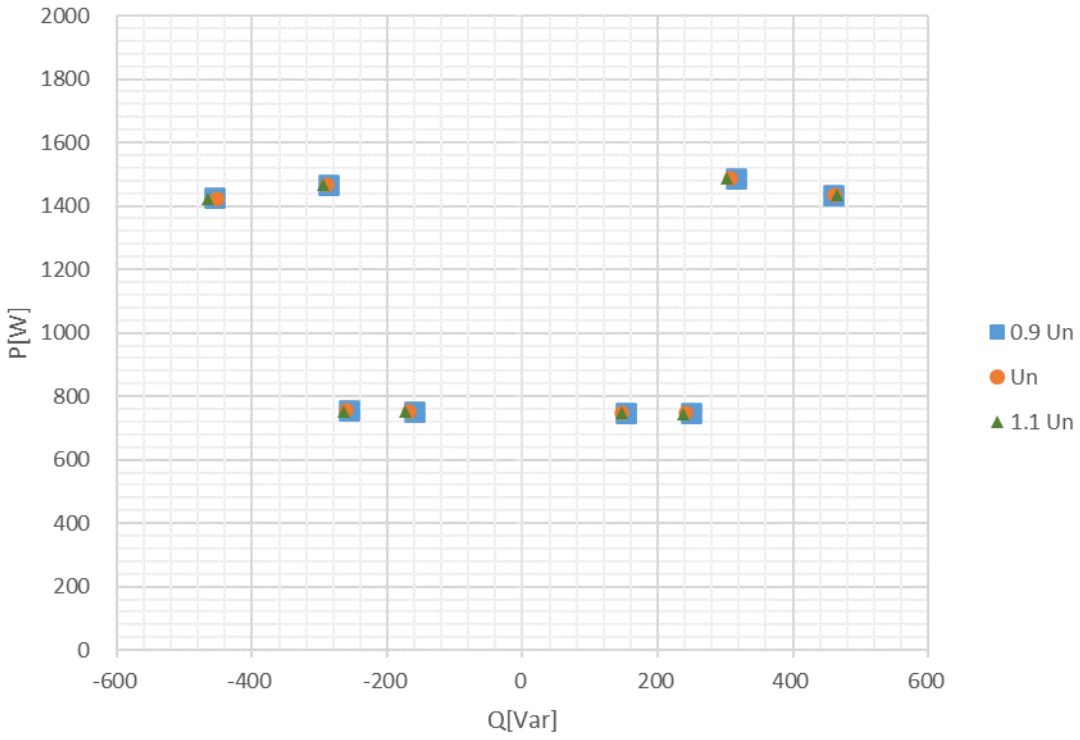
Setting values	cos φ under-excited	0,95	0,98
	cos φ over-excited	0,95	0,98

Test: CME06-2BM250

60 s mean value	0,9 U_n		U_n		1,1 U_n	
Active power	40 – 60% P_{Emax}	S_{Emax}	40 – 60% P_{Emax}	S_{Emax}	40 – 60% P_{Emax}	S_{Emax}
cos φ 0,95 over-excited						
U [V]	207,09	206,67	230,07	229,72	253,06	252,75
P_{E60} [W]	747	1436	747	1435	746	1435
Q_{E60} [Var]	249	459	242	461	239	465
S_{E60} [VA]	787	1508	785	1507	783	1508
cos $\varphi_{E60\ over\text{-}excited}$	0,949	0,953	0,951	0,952	0,952	0,951
$Q_{expected}$ [Var]	246	471	245	471	245	471
ΔQ_{E60} [%]	0,18	-0,78	-0,19	-0,61	-0,40	-0,37
cos φ 0,95 under-excited						
U [V]	207,09	207,12	230,07	230,11	253,06	253,10
P_{E60} [W]	755	1425	754	1424	754	1424
Q_{E60} [Var]	-256	-457	-261	-452	-265	-465
S_{E60} [VA]	797	1496	798	1494	799	1498
cos $\varphi_{E60\ under\text{-}excited}$	0,947	0,952	0,945	0,953	0,944	0,951
$Q_{expected}$ [Var]	-249	-467	-249	-467	-249	-468
ΔQ_{E60} [%]	-0,47	0,70	-0,76	0,94	-1,02	0,19
cos φ 0,98 over-excited						
U [V]	207,09	207,13	230,08	230,11	253,06	253,10
P_{E60} [W]	746	1486	746	1485	746	1488
Q_{E60} [Var]	152	316	147	308	146	303
S_{E60} [VA]	762	1519	761	1517	760	1518
cos $\varphi_{E60\ over\text{-}excited}$	0,980	0,978	0,981	0,979	0,981	0,980
$Q_{expected}$ [Var]	152	302	151	302	151	302
ΔQ_{E60} [%]	0,02	0,90	-0,27	0,44	-0,36	0,07

cos φ 0,98 under-excited						
U [V]	207,09	207,13	230,07	230,11	253,06	253,11
P_{E60} [W]	752	1466	752	1466	752	1466
Q_{E60} [Var]	-161	-287	-167	-289	-173	-295
S_{E60} [VA]	769	1494	770	1494	771	1495
cos $\varphi_{E60\ under\text{-}excited}$	0,978	0,981	0,976	0,981	0,974	0,980
$Q_{expected}$ [Var]	-153	-297	-153	-297	-153	-298
ΔQ_{E60} [%]	-0,51	0,69	-0,94	0,58	-1,33	0,19

Graph: Q/P diagram



Test:

applies for PGUs Type 2 - only inverter $\Sigma S_{Emax} \leq 4{,}6$ kVA

a) and b) For cos φ 0,95 over-excited and φ 0,95 under-excited, the active power will be measured at value between 40% P_{Emax} and 60% and S_{Emax} and a second time,

for cos φ 0,98 over-excited and φ 0,98 under-excited, the active power will be measured at a value between 40% P_{Emax} and 60% and S_{Emax}

applies for PGUs Type 2 - only inverter $\Sigma S_{Emax} \geq 4{,}6$ kVA

c) and d) For cos φ 0,90 over-excited and φ 0,90 under-excited, the active power will be measured at value between 40% P_{Emax} and 60% and S_{Emax} and a second time,

for cos φ 0,95 over-excited and φ 0,95 under-excited, the active power will be measured at a value between 40% P_{Emax} and 60% and S_{Emax}

applies PGUs Type 1 as well as for type 2 plants with Stirling generators and fuel cells $\Sigma S_{Emax} \leq 4{,}6$ kVA

e) without specification of the cos φ the active power will be measured at value between 40% P_{Emax} and 60% and S_{Emax}.

applies for PGUs Type 1 as well as for type 2 plants with Stirling generators and fuel cells $\Sigma S_{Emax} > 4{,}6$ kVA

f) and g) For cos φ 0,95 over-excited and cos φ 0,95 under-excited, the active power will be measured at value between 40% P_{Emax} and 60% and S_{Emax} and a second time,

for cos φ 0,98 over-excited and φ 0,98 under-excited, the active power will be measured at a value between 40% P_{Emax} and 60% and S_{Emax}

applies for PGUs Type 2 Asynchronous generators:

h) without specification of the cos φ the active power will be measured at value $S_{Emax.}$ The test is performed only at U_n.

Assessment criterion:

applies for PGUs Type 2 - only inverter $\Sigma S_{Emax} \leq 4{,}6$ kVA

The Q setpoint is calculated by using the required cos φ setpoint one time at 0.95 and one time at 0,98 and the measured apparent power of the fundamental. The test is passed if all the Q 60 s mean values of the fundamental component for a) are in the range of Q set point ± 4% P_{Emax} overexcited and for b) in the range of Q set point ± 4% P_{Emax} under-excited. In addition, a setting of the cos φ must be possible within a step size of at least 0.01.

applies for PGUs Type 2 - only inverter $\Sigma S_{Emax} \geq 4{,}6$ kVA

The Q setpoint is calculated by using the required cos φ setpoint one time at 0.90 and one time at 0,95 and the measured apparent power of the fundamental. The test is passed if all the Q 60 s mean values of the fundamental component for a) are in the range of Q set point ± 4% P_{Emax} overexcited and for c) in the range of Q set point ± 4% P_{Emax} under-excited. In addition, a setting of the cos φ must be possible within a step size of at least 0.01.

applies for PGUs Type 1 as well as for type 2 plants with Stirling generators and fuel cells $\Sigma S_{Emax} \leq 4{,}6$ kVA

The Q setpoint is calculated by using the required cos φ setpoint one time at 0.95 and one time at 0,98 and the measured apparent power of the fundamental. The test is passed if all the Q 60 s mean values of the fundamental from e) are in the range Q maximal overexcited till Q minimal under-excited.

applies for PGUs Type 1 as well as for type 2 plants with Stirling generators and fuel cells $\Sigma S_{Emax} \geq 4.6$ kVA

The Q setpoint is calculated by using the required cos φ setpoint one time at 0.95 and one time at 0,98 and the measured apparent power of the fundamental. The test is passed if all the Q 60 s mean values of the fundamental component for a) are in the range of Q set point ± 4% P_{Emax} overexcited and for f) in the range of Q set point ± 4% P_{Emax} under-excited. In addition, a setting of the cos φ must be possible within a step size of at least 0.01.

applies for PGUs Type 1 Asynchronous generators:

The test is passed if the cos φ Q 60 s mean values of h) is in the range cos φ = 0,95 under excited ±0,02.

Note:

cos φ Minimum step size: 0,01.

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

	The regulating and control behavior of the reactive power	P

The regulating or control behaviour of the reactive power is based on the PT-1 behaviour shown in Figure 10. Each reactive power value, which results from the control behaviour specified by the network operator, can be set between 6s and 60s (for Type 1 between 10s and 60s). The signal runtime includes the detection of the mains voltage or the active and reactive power.

Step response with the tolerances relevant for the evaluation

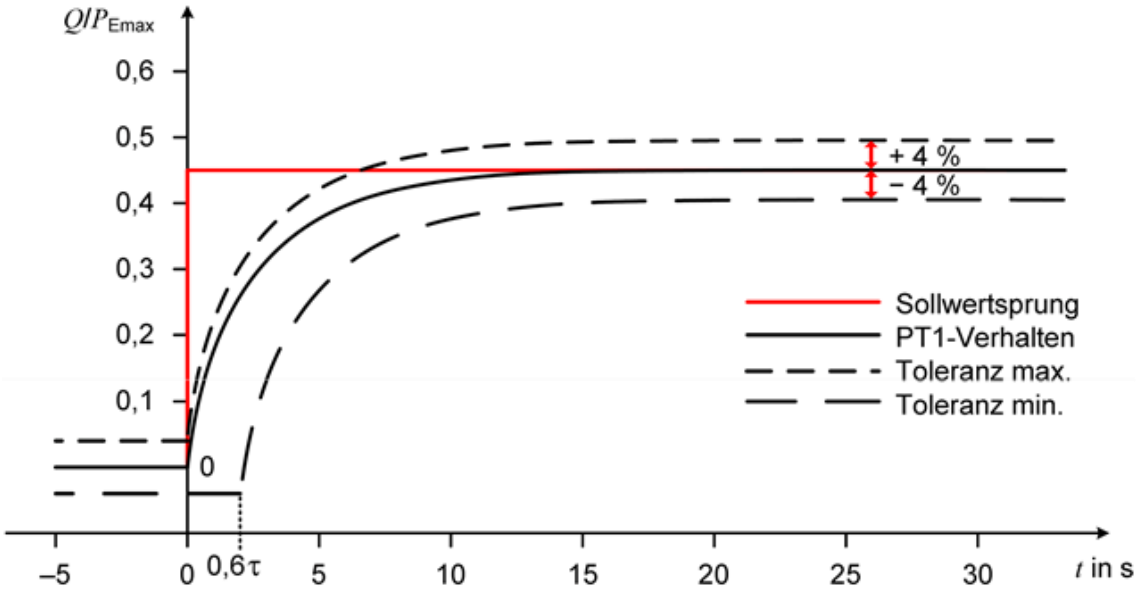


Figure 10 - Illustration at 3 tau = 10 s

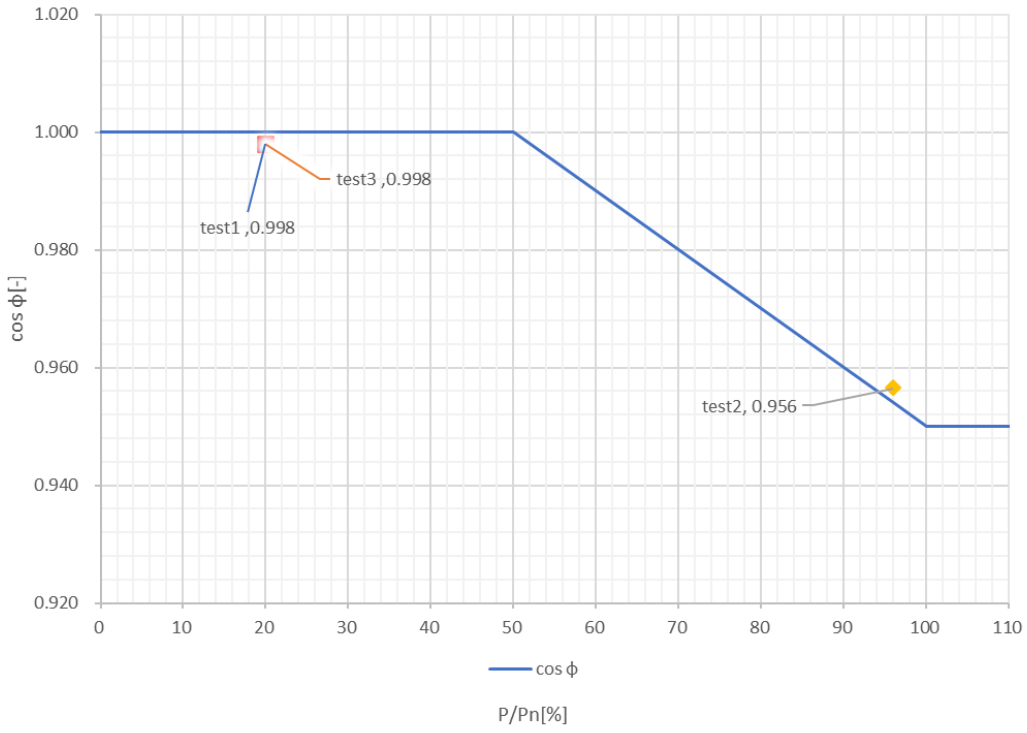
Comment:

The regulation and control behaviour according to PT-1 is implemented and checked for all reactive power control modes.

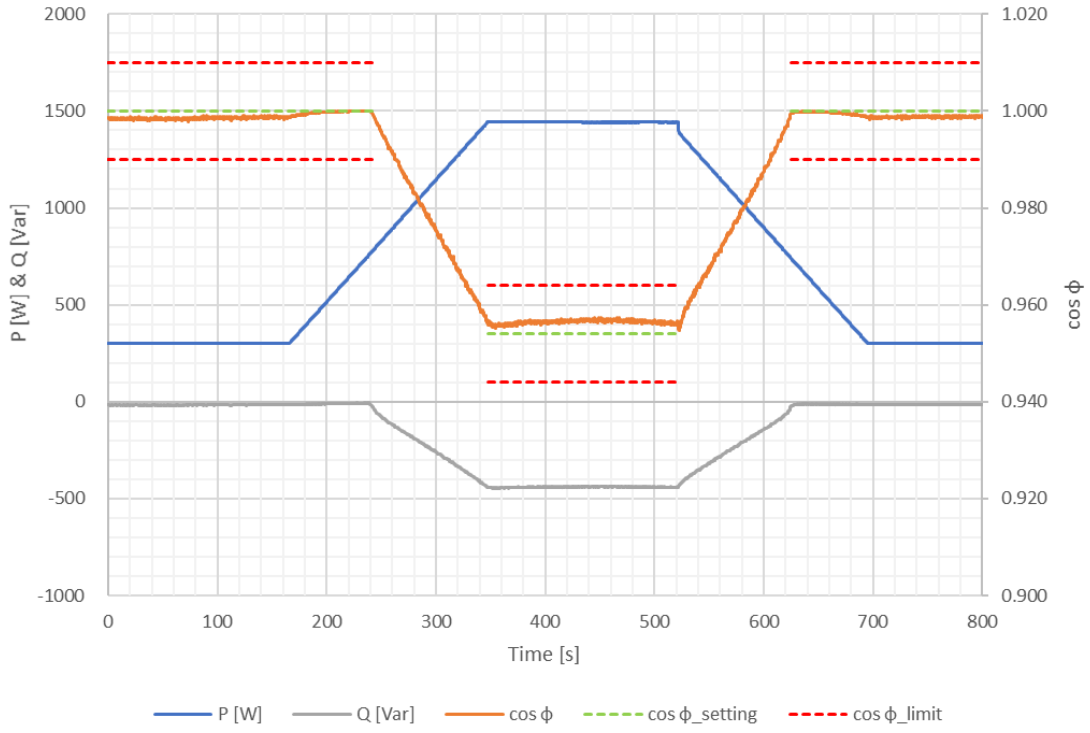
5.4.8.3 Test of the displacement factor/active power characteristic curve cos φ (P) The test serves as verification of the standard cos φ (P) curve according to VDE-AR-N 4105:2018-11, 5.7.2.4.	P

CME06-2BM250			
Test 1) for conducted PGUs (Battery) - Accuracy (characteristic)			
Measurement: 20-100-20% P_n			
P_E/P [%]	20	100	20
U [V]	230,05	230,28	230,07
P_{E30} [W]	303	1442	302
P_{E30} of P_E [%]	20,18	96,14	20,16
Q_{E30} [VAr]	-17	-440	-15
$Q_{expected}$	0	-454	0
ΔQ_{E30} [%]	-1,14	0,94	-0,98
cos φ_{E30}	0,998	0,956	0,999
cos $\varphi_{setpoint}$ of P_{E30}	1,000	0,954	1,000
Limit			
ΔQ_{E30} in %	≤ ±4,0% relative to P_{Emax}		P
DC setting values:			
DC Battery (Source) input current [A]	49,5		
DC Battery (Source) input voltage [V]	32,3		
P_{DC} [W]	1600		

Graph of Test 1)



Graph of Test 1)



Assessment criterion:

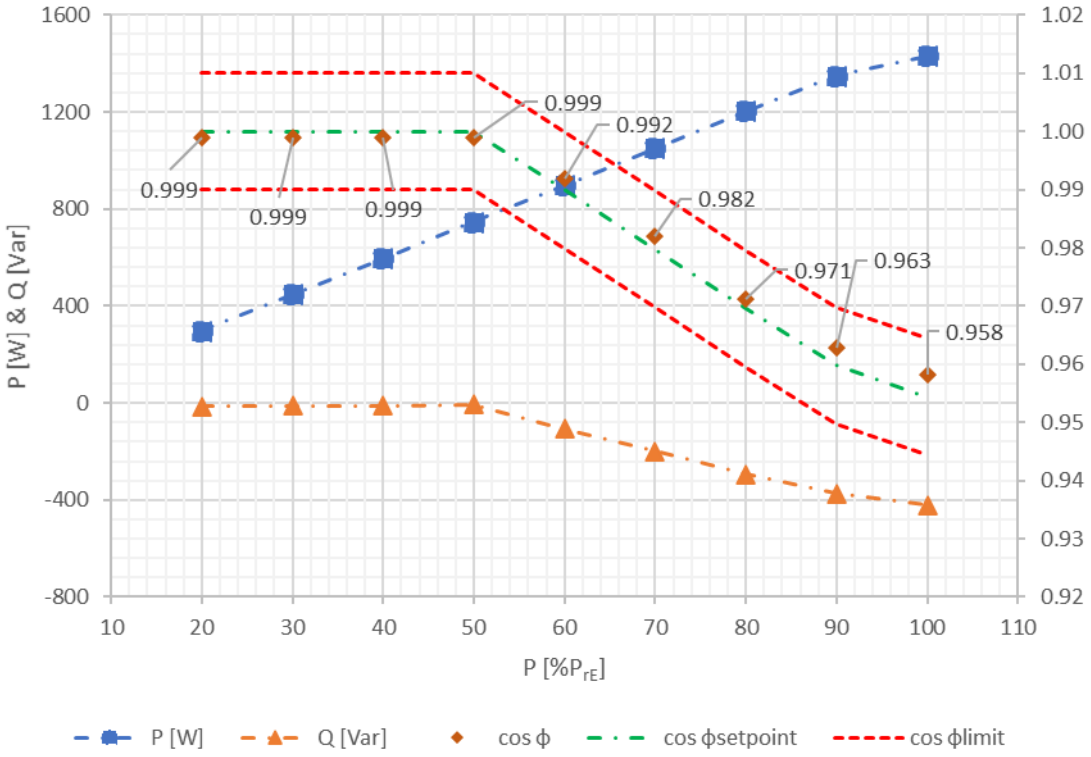
Test 5.4.8.3 (1) and (3) are passed if, for all calculated reactive power values, the maximum deviation between the reactive power setpoint (calculated from the characteristic curve to be verified) and the reactive power actual value at the generator terminals is a maximum of ±4,0% based on P_{Emax}.

Test 3) supply-dependent PGUs - Accuracy (characteristic curve)									
CME06-2BM250									
Measurement: 20-100% P_n									
P_{Emax}/P [%]	U [V]	P_{E30} [W]	P_{E30} of P_n [%]	Q_{E30} [VAr]	$Q_{expected}$	ΔQ_{E30} [%]	cos φ_{E30}	cos $\varphi_{setpoint}$ of P_{E30}	P_{DC}[W]
20	230,00	299	19,90	-13	0	-0,89	0,999	1,000	308
30	230,00	447	29,83	-12	0	-0,80	0,999	1,000	461
40	230,00	597	39,81	-10	0	-0,70	0,999	1,000	616
50	230,00	746	49,76	-6	0	-0,42	0,999	1,000	769
60	230,00	897	59,80	-108	-128	1,36	0,992	0,990	925
70	230,00	1050	69,99	-198	-214	1,05	0,982	0,980	1082
80	230,00	1204	80,29	-293	-305	0,80	0,971	0,969	1242
90	230,00	1350	89,99	-373	-395	1,44	0,963	0,960	1392
100	230,00	1431	95,38	-422	-448	1,75	0,958	0,954	1475
Measurement: 100-20% P_n									
P_{Emax}/P [%]	U [V]	P_{E30} [W]	P_{E30} of P_n [%]	Q_{E30} [VAr]	$Q_{expected}$	ΔQ_{E30} [%]	cos φ_{E30}	cos $\varphi_{setpoint}$ of P_{E30}	P_{DC}[W]
100	230,00	1430	95,33	-439	-447	0,56	0,956	0,954	1475
90	230,00	1350	90,00	-397	-395	-0,14	0,960	0,960	1392
80	230,00	1200	80,01	-315	-304	-0,76	0,968	0,969	1237
70	230,00	1050	70,01	-227	-214	-0,86	0,978	0,980	1083
60	230,00	898	59,85	-146	-128	-1,18	0,988	0,990	926
50	230,00	747	49,80	-30	0	-1,99	0,999	1,000	770
40	230,00	597	39,83	-13	0	-0,87	0,999	1,000	616
30	230,00	448	29,85	-10	0	-0,68	0,999	1,000	462
20	230,00	298	19,90	-13	0	-0,84	0,999	1,000	308
Limit									
ΔQ_{E30} in %	≤ ±4,0% relative to P_{Emax}						P		

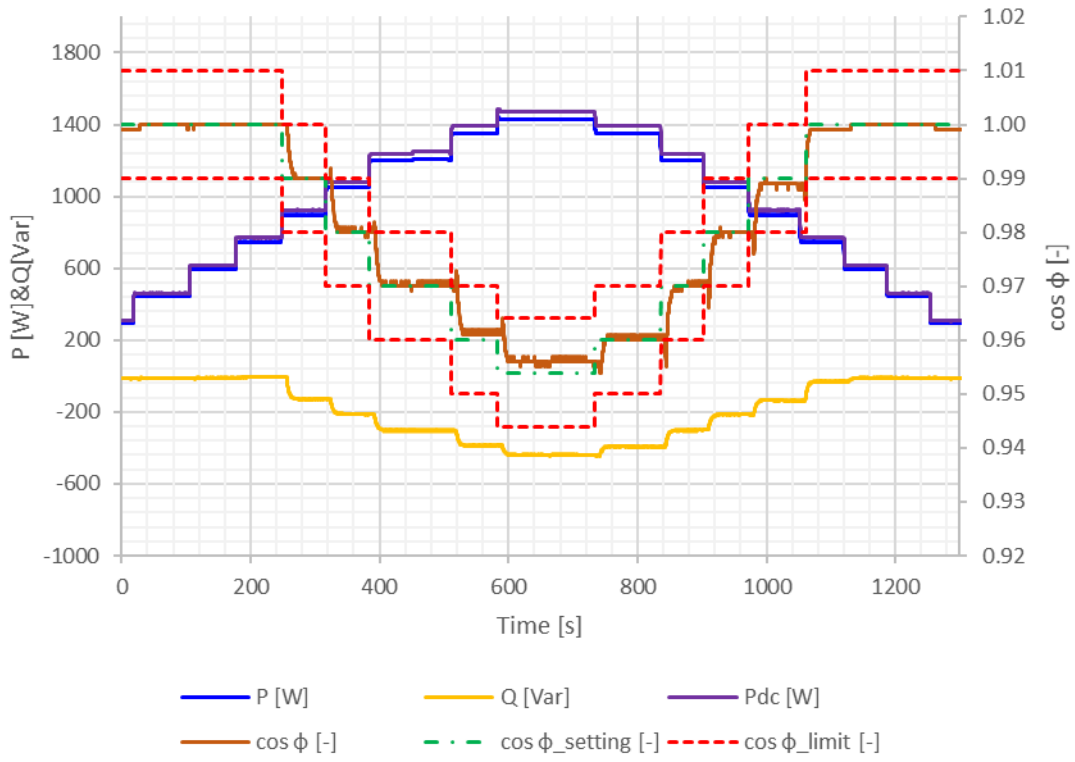
Test 4): supply-dependent PGUs - Dynamic				
CME06-2BM250				
P_{Emax}/P_n [%]	100	40	100	75
U [V]	230,1	230,04	230,1	230,08
P_{E30} [W]	1449	605	1449	1137
P_{E30} of P_n [%]	96,60	40,33	96,60	75,80
Q_{E30} [Var]	-450	-11	-449	-259
$Q_{expected}$	-450	0	-450	-263
ΔQ_{E30} [%]	0,00	-0,73	0,07	0,29

cos φ $_{E30}$	0,955	1,000	0,955	0,975
cos $\varphi_{setpoint}$ of P_{E30}	0,955	1,000	0,955	0,974
T [s]	--	9,2	9,0	10,2
Limit				
ΔQ_{E30} in %	≤ ±4,0% relative to P_{Emax}			P
DC setting values:				
Voltage of defined Battery [V]	49,5			
Current of defined Battery [A]	32,3			
P_{DC} [W]	1600			

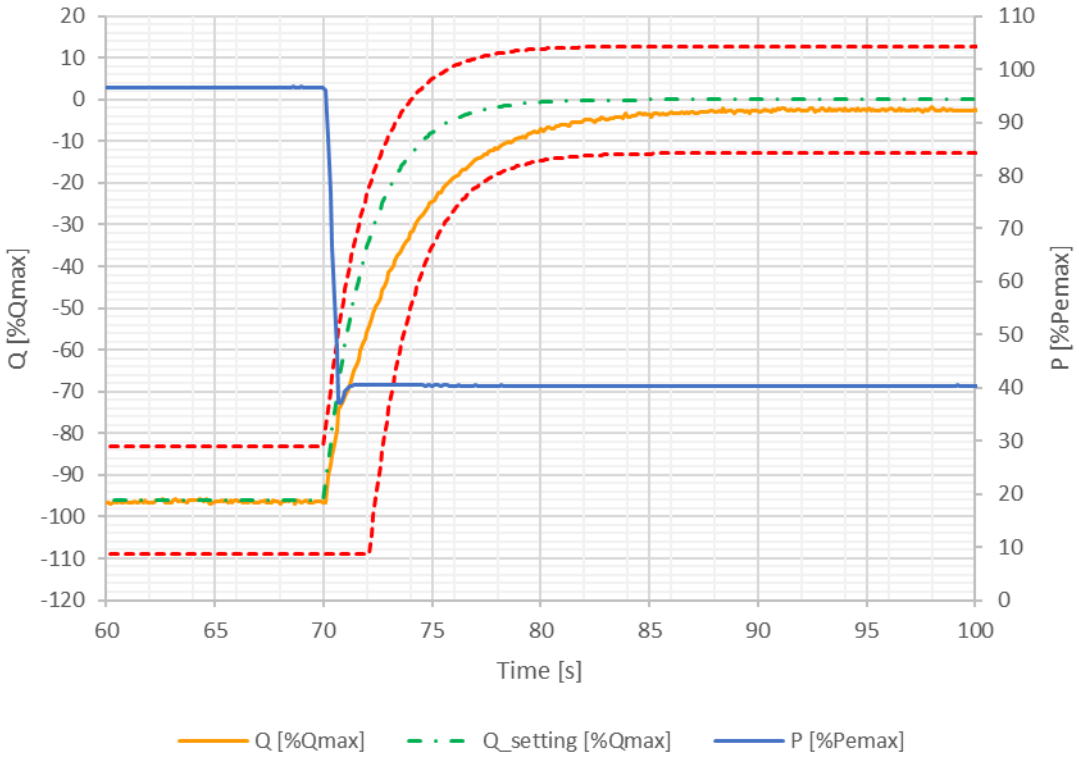
Graph of Test 3)



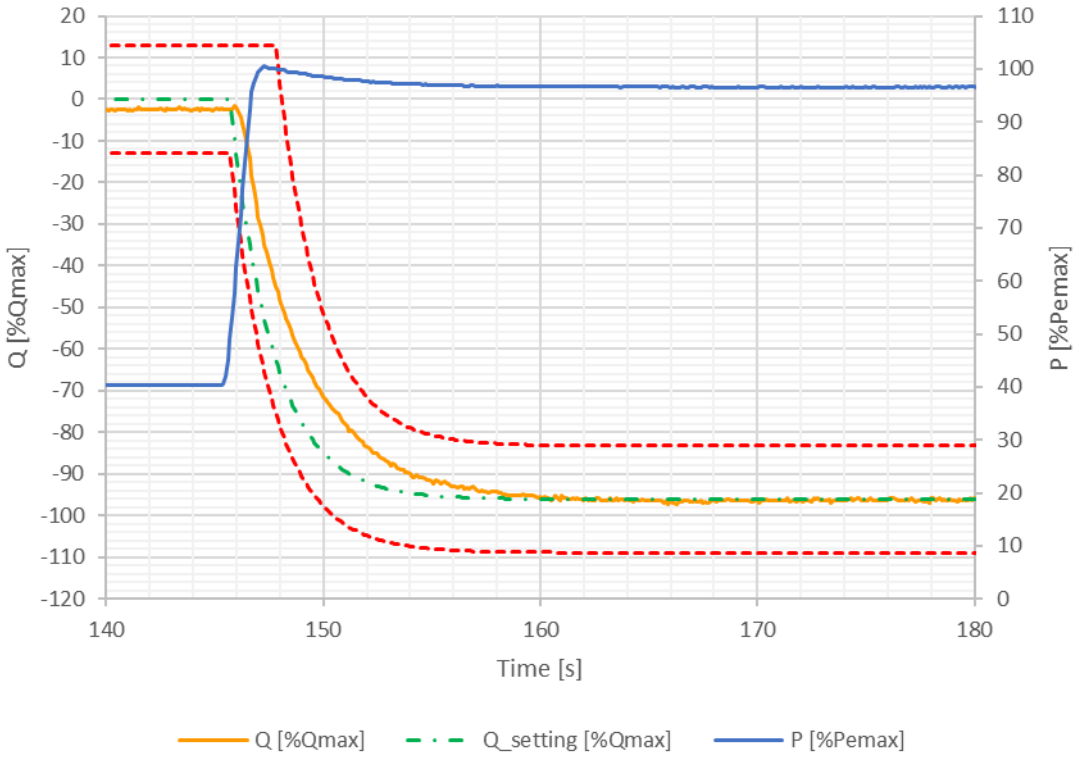
Graph of Test 3): 20% to 100% to 20%



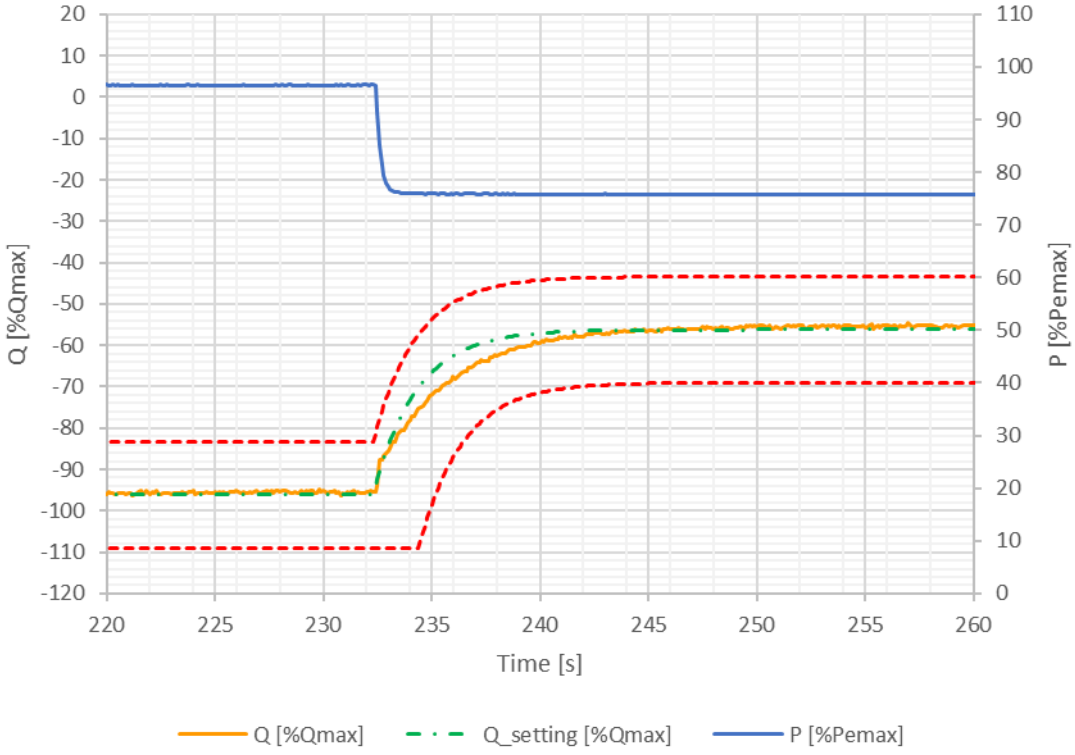
Graph of Test 4): 100% to 40%



Graph of Test 4): 40% to 100%



Graph of Test d): 100% to 75%



Assessment criterion:

Test 5.4.8.3 (2) is considered to have been passed if the PGU meets the requirements for the performance gradient in VDE AR-N 4105: 2018-11, 5.7.4.2.

Test 5.4.8.3 (4) is passed if the step response of the reactive power in test steps c) and e) shows PT1 behaviour according to VDE-AR-N 4105: 2018-11, 5.7.2.5 and for test step d) optionally the power gradient lies between the limits defined in VDE AR-N 4105: 2018-11, 5.7.4.1 or the step response of the reactive power also has PT1 behaviour according to VDE-AR-N 4105: 2018-11, 5.7.2.5.

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.4.8.4	Test the reactive power-voltage characteristic Q(U)	
	The validation of the Q (U) regulation according to VDE-AR-N 4105: 2018-05, 5.7.2.4 is divided into two partial tests, so that on the one hand the accuracy and on the other hand the dynamics of the Q (U) control is checked. For all inverter-coupled systems, only the inverter must be tested.	
5.4.8.4.1	Test of the reactive power-voltage characteristic Q(U)	N/A

Voltage steps	[Vac] L1	[Vac] L2	[Vac] L3	P_{start} [W]	$Q_{measured}$ [VAr]	$Q_{setting}$ [VAr]	ΔQ [%Pn]
100	--	--	--	--	--	--	--
99	--	--	--	--	--	--	--
98	--	--	--	--	--	--	--
97	--	--	--	--	--	--	--
96	--	--	--	--	--	--	--
95	--	--	--	--	--	--	--
94	--	--	--	--	--	--	--
93	--	--	--	--	--	--	--
92	--	--	--	--	--	--	--
91	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--
91	--	--	--	--	--	--	--
92	--	--	--	--	--	--	--
93	--	--	--	--	--	--	--
94	--	--	--	--	--	--	--
95	--	--	--	--	--	--	--
96	--	--	--	--	--	--	--
97	--	--	--	--	--	--	--
98	--	--	--	--	--	--	--
99	--	--	--	--	--	--	--
100	--	--	--	--	--	--	--
101	--	--	--	--	--	--	--
102	--	--	--	--	--	--	--
103	--	--	--	--	--	--	--
104	--	--	--	--	--	--	--
105	--	--	--	--	--	--	--
106	--	--	--	--	--	--	--
107	--	--	--	--	--	--	--
108	--	--	--	--	--	--	--
109	--	--	--	--	--	--	--

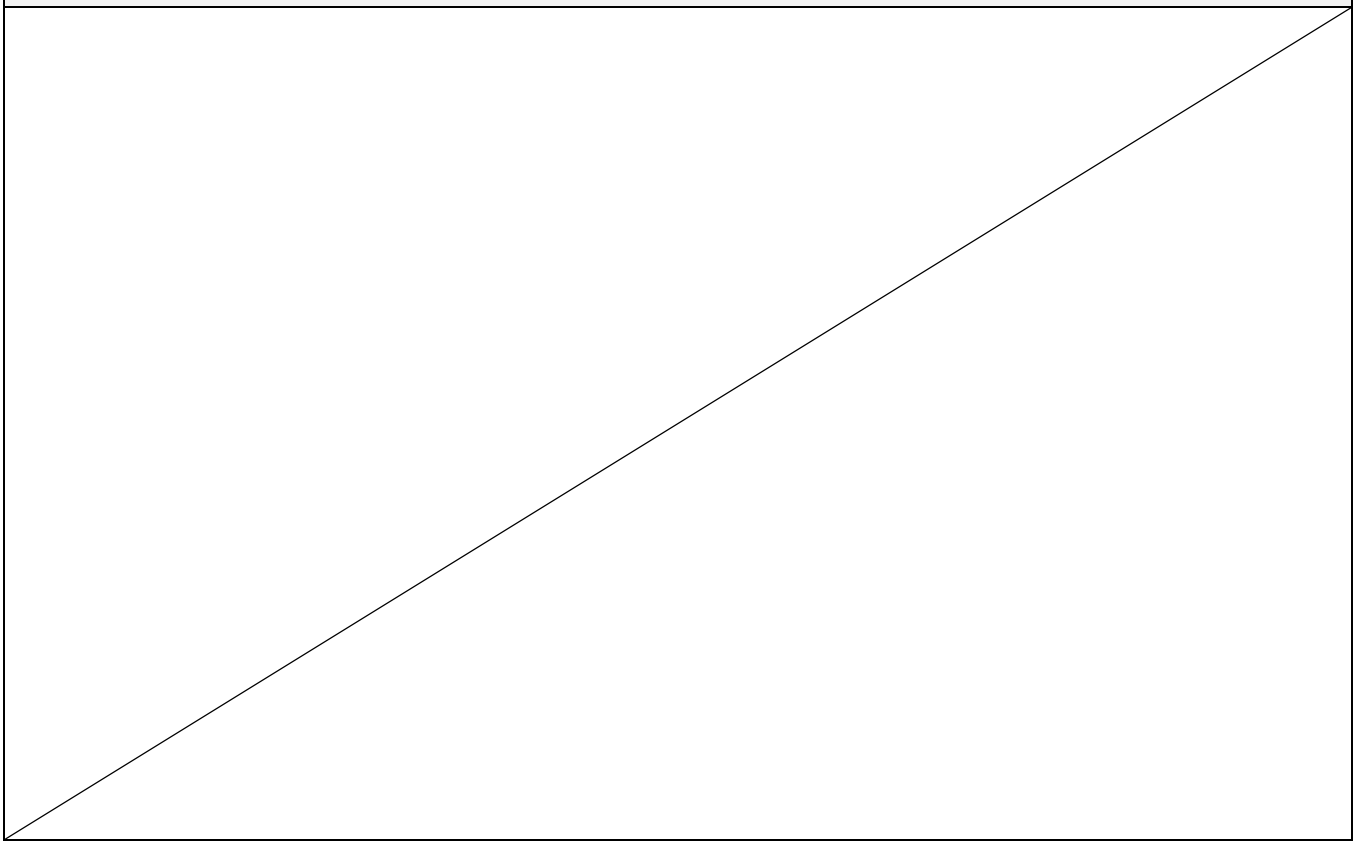
110	--	--	--	--	--	--	--
109	--	--	--	--	--	--	--
108	--	--	--	--	--	--	--
107	--	--	--	--	--	--	--
106	--	--	--	--	--	--	--
105	--	--	--	--	--	--	--
104	--	--	--	--	--	--	--
103	--	--	--	--	--	--	--
102	--	--	--	--	--	--	--
101	--	--	--	--	--	--	--
100	--	--	--	--	--	--	--

Assessment criterion:

To pass the Q (U) accuracy test, the measured stationary value pairs U_{PGU} and Q_{PGU}, taking account to the correct sign in the consumer metering system, must be within VDE-AR-N 4105: 2018-11, in 5.7.2.4, Figure 7 Q (U) shown characteristic. The stationary value pairs U_{PGU} and Q_{PGU} are determined by averaging over 30 seconds at the end of the respective measuring section analogously to Chapter 5.4.3.2. The permissible deviations are with the maximum measuring error of the voltage of 1% U_n stated in VDE-AR-N 4105: 2018-11 and a setting accuracy of 4% P_{EMax}.

$$Q_{EZE,tol} = \pm(\,0.01 \cdot \mathrm{U_{N,Y}} \cdot \mathrm{k_{QU}} + 0.04 \cdot P_{EMax}) = \pm 0{,}25 \cdot P_{EMax} \cdot (\sin(\arccos(\varphi_{min})) + 0.16).$$

Graph of Q(U) curve



5.4.8.4.2 Test of the dynamics of the Q(U) regulation	N/A

Setting values	Qmax [var]	kQU	X_{Netz}	$\Delta U_{ind,Y}$ [V]	$\Delta U_{kap,Y}$ [V]	Tau
	--	--	--	--	--	3Tau = 10s

Voltage steps	U_{start} [V] L1	U_{start} [V] L2	U_{start} [V] L3	U_{end} [V] L1	U_{end} [V] L2	U_{end} [V] L3	Q_{start} [Var]	Q_{end} [Var]	Settling time[s]
Test1:100→106,4	--	--	--	--	--	--	--	--	--
Test2:100→106,4	--	--	--	--	--	--	--	--	--
Test3:100→106,4	--	--	--	--	--	--	--	--	--
Test1:100→93,6	--	--	--	--	--	--	--	--	--
Test2:100→93,6	--	--	--	--	--	--	--	--	--
Test3:100→93,6	--	--	--	--	--	--	--	--	--

PV-curve simulated according to	
Voltage of defined MPP [V]	--
Current of defined MPP [A]	--
FFU of PV curve [1]	--
P_{DC} [W]	--

Assessment criterion:

For passing the test on the dynamics of the Q (U) control, the measured, time profiles of the reactive power have to be determined in the “positive sequence” Q_{PGU} during the entire measuring period in the PT1-like tolerances according to VDE-AR-N 4105: 2018-11, 5.7.2.5. For this purpose, the tolerance bands are entered into the diagram of the respective measurement according to the formulas below. It should be distinguished according to the expected PGU behavior (inductive, capacitive). An exemplary representation of the tolerance bands for the capacitive case is shown in Figure 6. Physically caused compensation processes (for example with type 1 PGU) are to be excluded from the evaluation, if they decay in a time range smaller than one third of the Q (U) - set time.

The variable T corresponds to the set - up time of the generating plant and three times the parameterized PT1 time constant Tau (T = 3Tau). The measurement of the time starts at the time of the excitation in 5. 4.8.3.2a) or the manipulation in 5.4.8.3.2 b).

Since the increase or decrease of the voltage according to the formula given in 5.4.8.3.2 represents only an approximation to the real behavior of the closed control loop, the steady-state final value Qset is determined from the measurement. For this purpose, a 10 - second mean value is formed at the end of the one - minute measurement period via the three - phase reactive power in the positive sequence system. Likewise, the starting value of the reactive power (positive sequence) Qstart (= offset) before the respective voltage change is determined over a 10-second averaging.

The response time of the overall system to be evaluated is measured starting from the excitation according to 5.4.8.3.2 a) or the manipulation according to 5.4.8.3.2 b) until reaching 95% of the steady end value in the positive sequence Qsoll and is with the factor 5/3 to multiply. This factor takes into account the effect of the feedback on the control dynamics of the Q (U) control and is strongly related to the formula of the net replacement reactance.

5.5	Testing of NS protection	
5.5.2	**NS protection**	**P**

The test for error detection with subsequent shutdown is carried out by means of error simulation, if necessary, with additional error tests (see VDE-AR-N 4105: 2018-11, 6.1).

5.5.2.1	Functional safety	P

Test procedural:

- It should be checked that a single error does not result in the loss of the security function.
- Typical errors must be checked, where applicable:
  a) Error of an AD converter or measuring card for voltage measurement;
  b) malfunction or freezing of a microprocessor or PLC;
  c) merging or clamping the contacts of the switching output;
  d) Overvoltage of the supply voltage;
  e) Breakage of the line in connecting lines between the measuring input and the control output to the dome switch;
  f) Failure of the supply voltage (auxiliary voltage).

Assessment criterion:

- The NS protection must send a shutdown command to the coupling switch.
- If the error is detected, the device is switched off within 10 s after error detection.

If the auxiliary voltage fails with the central NS protection or if the control fails with the integrated NS protection, the switch-off command must be given immediately

Note:

The errors in the control circuit simulate that the safety is even ensured during a single fault.

Component No.	Fault	Test condition		Test time	Fuse No.	Test condition		Test time
		AC	DC			AC	DC	
Relay fault RY3 pin3 to pin5	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3029 “Relay Sticking” No damage, no hazard, no fire
Relay fault RY3 pin6 to pin4	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow. Error message: 3029 “Relay Sticking” No damage, no hazard, no fire
Relay fault RY4 pin3 to pin5	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow. Error message: 3029 “Relay Sticking” No damage, no hazard, no fire
Relay fault RY4 pin6 to pin4	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3029 “Relay Sticking” No damage, no hazard, no fire
Relay fault RY2 pin3 to	short before	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from

pin4	start-up							blue to yellow Error message: 3029 “Relay Sticking” No damage, no hazard, no fire
Grid votage sampling R257	Short	230V 6A	27V 46A	10	--	230V 0,05A	27V 0A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3017 “Grid Overvoltage” No damage, no hazard, no fire
Grid votage sampling R258	Open	230V 6A	27V 46A	10	--	230V 0,05A	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow. Error message: 3021 “Grid Undervoltage” No damage, no hazard, no fire
Grid votage sampling R268	Short	230V 6,89A	26V 62A	10	--	230V 0,05	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow. Error message: 3017 “Grid Overvoltage”, 3019 “Grid Overvoltage” No damage, no hazard, no fire
Grid votage sampling R268	Open	230V 6,89A	26V 62A	10	--	230V 0,05	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3022 Grid Undervoltage No damage, no hazard, no fire
Vinv voltage sampling R246	Short	230V 6,89A	26V 62A	10	--	230V 0,05	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3001 “Inverter Output Overvoltage” No damage, no hazard, no fire
Vinv voltage sampling R246	Open	230V 6,89A	26V 62A	10	--	230V 0,05	26V 0,05A	The unit has stopped working LED colour changes from blue to yellow Error message: 3002 “Inverter Output Undervoltage” No hazard. No damage.no fire
Vinv voltage sampling R252	Short	230V 6,89A	26V 62A	10	--	230V 0,05	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3001 “Inverter Output Overvoltage”

								No damage, no hazard, no fire
Vinv voltage sampling R252	Open	230V 6,89A	26V 62A	10	--	230V 0,05	26V 0,05A	The unit has stopped working LED colour changes from blue to yellow Error message: 3002 “Inverter Output Undervoltage” No hazard. No damage.no fire
BUS voltage sampling R229 R226 R233 R234	Short	230V 6,89A	26V 62A	10	--	230V 0A	26V 0A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3006 “Inverter Output Overcurrent” No hazard. No damage.no fire
BUS voltage sampling R229	Open	230V 6,89A	26V 62A	10	--	230V 0A	26V 0A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3001 “Inverter Output Overvoltage” No damage, no hazard, no fire
BUS voltage sampling R238 R239 R240 R241	Short	230V 6,89A	26V 62A	10	--	230V 0A	26V 0A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3006 “Inverter Output Overcurrent” No hazard. No damage.no fire
BUS voltage sampling R239	Open	230V 6,89A	26V 62A	10	--	230V 0A	26V 0A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3036 “Busbar Overvoltage”, 3037 “Busbar Overvoltage” No hazard. No damage.no fire
DCI defected IC11 pin12 to pin13	Short	230V 6,89A	26V 62A	10	--	230V 0A	26V 0A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3031 “Grid Overload” No hazard. No damage.no fire
DCI detection failuer IC11pin12 to pin15	Short	230V 6,89A	26V 62A	10	--	230V 0A	26V 0A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3031 “Grid Overload” No hazard. No damage.no fire
PV ISO	short	230V	26V	10	--	230V	26V	The inverter did not start-up.

defected R367 R363 R369 R371	before start-up	0,05A	0,05A			0,05A	0,05A	LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
PV ISO defected R364 R368 R370 R372	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
PV ISO defected R381 R378 R384 R384	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
PV ISO defected R383 R380 R385 R387	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
PV ISO defected R393	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
PV ISO defected R139	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
PV ISO defected IC14 Apin2 to pin1	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
PV ISO defected IC14 Apin3 to pin1	short before start-up	230V 0,05A	26V 0,05A	10	--	230V 0,05A	26V 0,05 A	The inverter did not start-up. LED colour changes from blue to yellow Error message: 3033 Insulation Fault Detected No hazard. No damage.no fire
Grid voltage sampling R62	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3002

								Inverter Output Undervoltage No hazard. No damage.no fire
Grid voltage sampling IC2 pin2 to pin1	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3037 “Busbar Overvoltage” No hazard. No damage.no fire
Grid voltage sampling IC2 pin3 to pin1	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3037 “Busbar Overvoltage” No hazard. No damage. no fire
Vinv voltage sampling R60	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 0116 “Short Circuit Protection” Q1 Q5 Q8 Q10 damage. No hazard. no fire
Vinv voltage sampling IC3 pin2 to pin1	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3002 “Inverter Output Undervoltage” No hazard. No damage.no fire
Vinv voltage sampling IC3 pin3 to pin1	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter immediately disconnection from grid. LED colour changes from blue to yellow Error message: 3002 “Inverter Output Undervoltage” No hazard. No damage.no fire
Communication between Master DSP IC16Pin87and Slave DSP IC7Pin47	Open	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter disconnection from grid. LED colour changes from blue to yellow Error message: 2003 “Inverter Communication Error” No hazard. No damage.no fire
Communication between Master DSP IC16 Pin86 and Slave DSP IC7	Open	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter disconnection from grid. LED colour changes from blue to yellow Error message: 2003 “Inverter Communication

Pin48								Error” No hazard. No damage.no fire
DSP IC16 pin 10 to pin11 (+3.3VD to GND)	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter disconnection from grid. LED colour changes from blue to yellow Error message: 2003 “Inverter Communication Error” No hazard. No damage.no fire
DSP IC16 pin12 to pin13 (XL2)	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter disconnection from grid. LED colour changes from blue to yellow Error message: 2003 “Inverter Communication Error” No hazard. No damage.no fire
DSP IC7 pin 22 to pin19 (+3.3VD to GND)	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter disconnection from grid. LED colour changes from blue to yellow Error message: 2003 “Inverter Communication Error” No hazard. No damage.no fire
DSP IC7 pin12 to pin13 (XL1)	Short	230V 6,3A	27V 48,5A	10	--	230V 0,05A	26V 0,05A	The inverter disconnection from grid. LED colour changes from blue to yellow Error message: 2003 “Inverter Communication Error” No hazard. No damage.no fire
Note: The errors in the control circuit simulate that the safety is even ensured during a single fault.								
Assessment criterion: The NS protection must send a shutdown command to the coupling switch. If the error is detected, the device is switched off within 10 s after error detection. If the auxiliary voltage fails with the central NS protection or if the control fails with the integrated NS protection, the switch-off command must be given immediately.								

5.3 Central NS-protection	N/A
5.5.3.1 Test	**N/A**
- The auxiliary voltage of the NS protection is switched off	**N/A**
- The test facility on the NS protection is actuated	**N/A**
Assessment criterion: The test is considered to have been passed if a signal for the immediate shutdown is generated.	
Note: The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.	

5.5.4 Integrated NS protection	P
The integrated NS protection is tested in 5.5.7 and in connection with the examination of the entire NS protection chain and switch.	
Note: For test results see 5.5.2.1 Functional safety.	

5.5.6 Interface switch	
5.5.6.1 General	**P**
These tests serve to demonstrate the requirements of VDE-AR-N 4105: 2018-11, 6.4	
5.5.6.2 Documentation for the design of the central interface switch	**N/A**
Some details of the central NS protection and the PGU are necessary for the design of a central interface switch. The manufacturer's documentation must therefore contain the following information.	
- maximum operating time of the central interface switch (manufacturer NS protection)	**N/A**
- Operating time of the protective device (manufacturer NA protection)	**N/A**
- maximum initial short-circuit alternating current (manufacturer PGU)	**N/A**
- maximum AC circuit breaker / grid fuse for the PGU (manufacturer PGU)	**N/A**
- circuit diagram / connection diagram (NS protection / coupling switch) contains the required control and feedback signals (manufacturer NS protection)	**N/A**
Assessment criterion: The test is considered as pass when the documentation of the manufacturer included the necessary information.	
Note: Information checked in the manual and datasheet for the external NS protection and coupling switch used in the PGU.	

5.5.6.3 Integrated interface switch	**P**
5.5.6.3.1 Test (functional chain integrated NS-protection and integrated interface switch)	**P**
Following monitoring options of an interface switch are valid (a) or (b) or (c):	
(a) Use of a interface switch in which a control voltage must be constantly applied when switched on and which switches off automatically when this voltage is not present. The operational switch-on and switch-off processes is monitored	
The disconnection of the control voltage leads to the instantaneous disconnection of the interface switch.	P
A simulated defect during the closing and opening of the interface switch leads to an instantaneous shutdown of the PGU. A restart is not possible.	P
A simulated defect of the interface switch after the NS protection as operated leads to an instantaneous shutdown of the PGU. A restart is not possible.	P
The switch-off time of the whole reaction chain is within 0,2s.	P
(b) The interface switch is switched on and off at least once a day by the NS protection and the proper functioning of the coupling switch is monitored.	
A simulated defect of the interface switch during the daily test leads to an instantaneous shutdown of the PGU. A restart is not possible.	N/A
A simulated defect of the interface switch after the NS protection has operated leads to an instantaneous shutdown of the PGU. A restart is not possible.	N/A
A function for daily switching on and off is available and explained by a manufacturer's declaration.	N/A
(c) Use of the integrated coupling switch and the integrated NA protection for PV and battery converters according to DIN EN 62109 (VDE 0126-14-1).	
The integrated interface switch and NS protection is complied with DIN EN 62109 (VDE 0126-14-1).	N/A
Note: See test results 5.5.2.1 functional safety.	
Main Test Relay model: HF140FF-G Alternative Relay model: CHI05-V-212H1A2H	
The inverter has a galvanic separating break device. The interface switch is short-circuit proof for the maximum short-circuit current of the power generation unit.	
Max. initial short-circuit current of the PGU (power generation unit)	= 6,6 A, 230 Vac
Max. switching current relay HF140FF-G CHI05-V-212H1A2H	 =16 A, 250 Vac =10 A, 250 Vac
Response time of interface switch for integrated NS protection	≤ 15ms

Datasheet of the relay (Interface switch):

Main Test Relay model: HF140FF-G

HF140FF-G MINIATURE INTERMEDIATE POWER RELAY

c UL us
File No.:E134517
File No.:R50149131
File No.:CQC10002046173

Features

- 16A switching capability
- 5kV dielectric strength (between coil and contacts)
- 2.0mm contact gap available
- Plastic sealed and flux proofed types available
- Sockets available
- UL insulation system:Class F

RoHS compliant

CONTACT DATA

Contact arrangement	2A, 2C
Contact resistance	100mΩ max.(at 1A 6VDC)
Contact material	$AgSnO_2$
Contact rating (Res. load)	16A 250VAC
Max. switching voltage	250VAC
Max. switching current	16A
Max. switching power	4000VA
Mechanical endurance	W type: 1 x 10^5OPS
Electrical endurance	W type(1.5mm)-2ZWTF: NO 3 x 10^4OPS, NC 1 x 10^4OPS (Resistive load,1s on 9s off) W type(2.0mm)-2ZWTF(456): NO 3 x 10^4OPS, NC 6 x 10^3OPS (Resistive load,1s on 9s off)

Notes: 1) The data shown above are initial values.
2) For plastic sealed type, the venting-hole should be excised in electrical endurance test.
3) Large gap (W type) products: the ambient temperature of the relay is -40°C ~ 75°C; (When used at 75°C ~ 85 °C, step-down maintenance is required: applying rated voltage for 200ms firstly to ensure stable connection, then reduce to and maintain 45- 65% of rated voltage.)

SAFETY APPROVAL RATINGS

UL	16A 250VAC Resistive at 85°C 1/3HP 125VAC NO/NC,40°C 3/4HP 250/240VAC,NO,40°C TV-5, 125VAC,40°C
TÜV	16A 250VAC Resistive at 85°C
CQC	16A 250VAC Resistive at 85°C

Notes: 1) All values unspecified are at room temperature.
2) Only typical loads are listed above. Other load specifications can be available upon request.

CHARACTERISTICS

Insulation resistance		1000MΩ (at 500VDC)
Dielectric strength	Between coil & contacts	5000VAC 1min
	Between contacts sets	3000VAC 1min
	Between open contacts	W type:2500VAC 1min
Surge voltage (between coil & contacts)		10kV (1.2/50 μs)
Operate time (at nomi. volt.)		20ms max.
Release time (at nomi. volt.)		15ms max.
Humidity		5% to 85% RH
Ambient temperature		-40°C to 85°C
Shock resistance	Functional	98m/s²
	Destructive	980m/s²
Vibration resistance		10Hz to 55Hz 1.5mmDA
Termination		PCB
Unit weight		Approx. 19g
Construction		Plastic sealed, Flux proofed

Notes: 1) The data shown above are initial values.

COIL

Coil power	W type(1.5mm): Approx. 800mW W type(2.0mm): Approx. 1.4W

HONGFA RELAY
ISO9001, IATF16949 , ISO14001, ISO45001, IECQ QC 080000, ISO/IEC 27001 CERTIFIED 2024 Rev. 1.00

COIL DATA

at 23°C

W Type (1.5mm)

Nominal Voltage VDC	Pick-up Voltage VDC max.	Drop-out Voltage VDC min.	Max. Allowable Voltage VDC	Coil Resistance Ω
3	≤2.40	≥0.15	3.3	11.3 x (1±10%)
5	≤4.00	≥0.25	5.5	31 x (1±10%)
6	≤4.80	≥0.30	6.6	45 x (1±10%)
9	≤7.20	≥0.45	9.9	101 x (1±10%)
12	≤9.60	≥0.60	13.2	180 x (1±10%)
15	≤12.0	≥0.75	16.5	280 x (1±10%)
18	≤14.4	≥0.90	19.8	405 x (1±10%)
24	≤19.2	≥1.20	26.4	720 x (1±10%)
36	≤28.8	≥1.80	39.6	1620x (1±10%)
48	≤38.4	≥2.40	52.8	2880 x (1±10%)
60	≤48.0	≥3.00	66.0	4500 x (1±10%)
110	≤88.0	≥5.50	121.0	15100 x (1±10%)

W Type (2.0mm)

Nominal Voltage VDC	Pick-up Voltage VDC max.	Drop-out Voltage VDC min.	Max. Allowable Voltage VDC	Coil Resistance Ω
3	≤2.40	≥0.15	3.3	6x (1±10%)
5	≤4.00	≥0.25	5.5	18 x (1±10%)
6	≤4.80	≥0.30	6.6	26 x (1±10%)
9	≤7.20	≥0.45	9.9	58 x (1±10%)
12	≤9.60	≥0.60	13.2	102 x (1±10%)
15	≤12.0	≥0.75	16.5	160 x (1±10%)
18	≤14.4	≥0.90	19.8	230 x (1±10%)
24	≤19.2	≥1.20	26.4	410 x (1±10%)
36	≤28.8	≥1.80	39.6	925x (1±10%)
48	≤38.4	≥2.40	52.8	1650 x (1±10%)
60	≤48.0	≥3.00	66.0	2570 x (1±10%)
110	≤88.0	≥5.50	121.0	8068 x (1±10%)

Notes: 1) The data shown above are initial values.
2) Maximum voltage refers to the maximum voltage which relay coil could endure in a short period of time.
3) In order to meet the stated product performance, please apply rated voltage to coil.
4) For the CO version whose contact gap is 1.5 mm/2.0mm, the operation voltage ≤85% of rated voltage, the coil resistance tolerance is (1±15%).

ORDERING INFORMATION

HF140FF-G/ 024 -2Z S W T G F (XXX)

Type		
Coil voltage	3,5,6,9,12,15,18,24,36,48,60,110VDC	
Contact arrangement	**2H:** 2 Form A	**2Z:** 2 Form C
Construction	**S:** Plastic sealed	**Nil:** Flux proofed
Contact Gap	**W:** Large contact gap	
Contact material	**T:** $AgSnO_2$	
Contact plating	**G:** Gold plated	**Nil:** No gold plated
Insulation standard	**F:** Class F	**Nil:** Class F
Special code	**XXX:** Customer special requirement	**Nil:** Standard

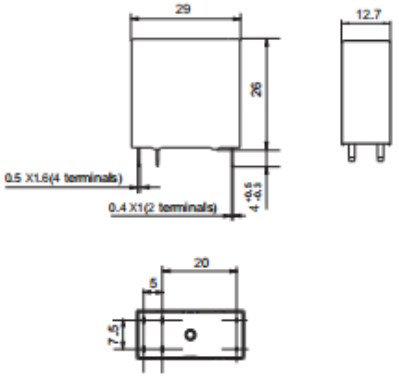
Notes: 1) We recommend flux proofed types for a clean environment (free from contaminations like H_2S, SO_2, NO_2, dust, etc.). We suggest to choose plastic sealed types and validate it in real application for an unclean environment (with contaminations like H_2S,
2) Contact is recommended for suitable condition and specifications if water cleaning or surface process is involved in assembling relays on PCB.SO_2, NO_2, dust, etc).
3) There are two specifications to W type: 1.5mm contact gap and 2.0mm contact gap. The default W type is 1.5mm. So please add the special code "(456)" when releasing order,if 2.0mm contact gap is required.
4) The customer special requirement express as special code after evaluating by Hongfa. e.g.(456) means contact gap can reach 2.0mm.

OUTLINE DIMENSIONS, WIRING DIAGRAM AND PC BOARD LAYOUT

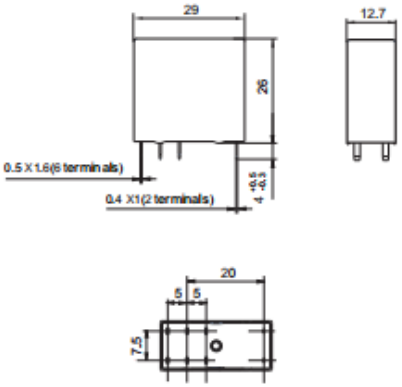
Unit: mm

Outline Dimensions

2 Form A



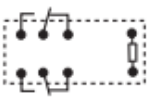
2 Form C



Wiring Diagram (Bottom view)

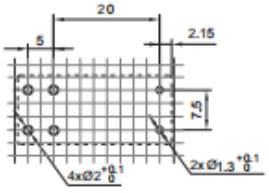
2 Form A

2 Form C

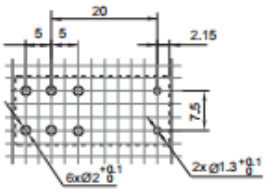


PCB Layout (Bottom view)

2 Form A



2 Form C



Remark: 1) In case of no tolerance shown in outline dimension: outline dimension ≤1mm, tolerance should be ±0.2mm; outline dimension >1mm and ≤5mm, tolerance should be ±0.3mm; outline dimension >5mm, tolerance should be ±0.4mm.
2) The tolerance without indicating for PCB layout is always ±0.1mm.
3) The width of the gridding is 2.5mm.

Alternative Relay model: CHI05-V-212H1A2H

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DongGuan Churod Electronics Co., Ltd.

RELAY SPECIFICATION

(File No.: 001254 / Version: 00 / Issued Date: dec.28th, 2022)

Product Description	**CHI05-V-212H1A2**
Part Number	
Customer	

Customer Approval

STAMPING AREA

Issued	Checked	Approved
Happy	Simon Fu	Andy.Tang

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SAFETY STANDARD	
UL certificate	E341422
TUV certificate	R50512829
CQC certificate	CQC21002306274

COIL CHARACTERISTICS

Coil resistance	102.8±10% Ω
Rated voltage	12VDC
Max. allowable voltage	130% of rated coil voltage
Rated power	1400 mW
Operate voltage	≤9.0VDC
Release voltage	≥0.6VDC
Hold Voltage(See Notes 4)	≤5.4VDC(@23℃) ≤6.6VDC(@85℃)

CONTACT RATINGS

Contact configuration	2 Form A (DPST)
Contact material	AgSnO2+Cu
Initial contact resistance	≤100mΩ at 6VDC/1A
Rated switching voltage (Normally Open)	250VAC
Rated switching voltage (Normally Close)	----
Rated current (Normally Open)	10A
Rated current (Normally Close)	----

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Rated switching power (Normally Open)	2500VA
Rated switching power (Normally Close)	----
Minimum applicable load (Normally Open)	5VDC 100mA
Minimum applicable load (Normally Close)	5VDC 100mA
Operate time	≤15ms, excluding bounce time
Release time	≤10ms, excluding bounce time
Mechanical endurance	300K cycles,60 cycles/minute
Electrical endurance (Resistive Load)	10A, 250VAC, 30K cycles, 6 cycles/minute
Contact Gap	2.0mm
INSULATION PERFORMANCE	
Dielectric strength	2,500VAC 1minute, between open contacts
	2,500VAC 1minute, between contacts groups
	5,000VAC 1minute, between coil to contacts
Impulse withstand voltage	10KV (1.2/50μs), between coil to contacts
Insulation resistance	1000MΩ at 500VDC, between open contacts and coil to contacts
Insulation systems (UL)	155 (F)
Insulation type	Reinforced insulation
ENVIRONMENT PERFORMANCE	
Category of protection (IEC61810-1)	RTII (Flux tight)
Operating temperature	-40~85℃
Operating humidity	20~85%RH

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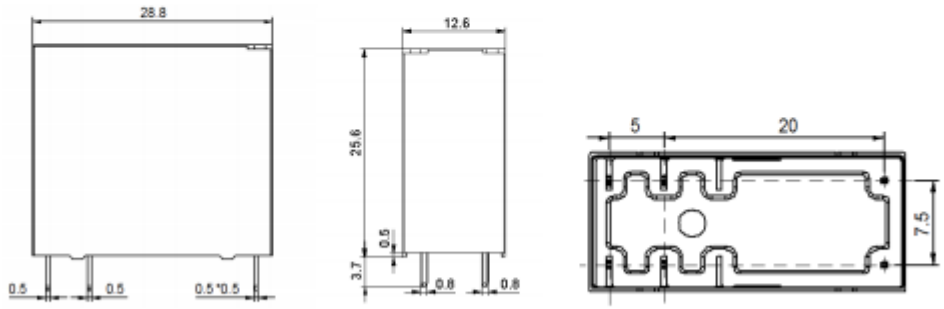
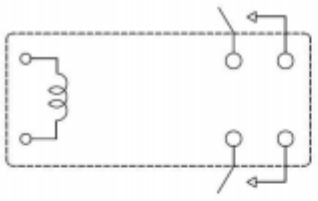
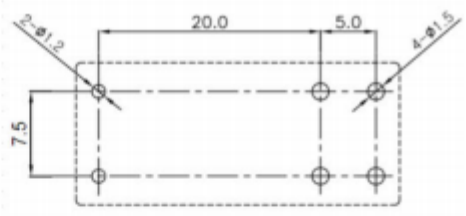
Outline dimension, general toleance: ±0.5mm



Wiring diagram (Bottom View)



Mounting dimensions (Bottom View), general Toleance: ±0.3mm



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5.5.7.2 Check of setting values	**P**
5.5.7.2.1 Test	**P**
Test procedural:	

- Before the further tests begin, the factory setting values of the test object must be checked.
- The test object must be reset to factory settings.
- The test object must be put into operation according to the user manual. If an operator input is required, the setting for VDE-ARN 4105:2018 must be selected.

Assessment criterion:

- The exam is passed if the following points are met:
- The factory setting values correspond
  a) With integrated NA protection of VDE-AR-N 4105: 2018-11, 6.5.2 Table 2 (see also Table 36).
  b) With central NA protection, either the factory settings of VDE-AR-N 4105: 2018-11, 6.5.2, Table 2 (see also Table 36) or these values can be set.
- In the event of an operator input, the test object only goes into operation after settings have been selected.
- The setting values that can be changed according to 4105: 2018-11, 6.5.1 and 6.5.2 can be set within the specified limits and are protected against unauthorized access.
- The setting values that cannot be changed according to VDE-AR-N 4105: 2018-11, 6.5.1 and 6.5.2 cannot be changed or are protected from unauthorized access by an additional separate protection system

Setting values:

PGU type	Description	Parameter name	Set value in p.u.	Set value L-N	Set value L-L *2)
	nominal voltage	U_n	1	230,0V	400V
	Nominal frequency	f_n	1	50Hz	50Hz
a) name set of parameters (Parameter setup name in manual or software)					
☐ Stirling generators, fuel cells, coupled directly or via a converter Synchronous and asynchronous generators with $P_n \leq 50$ kW	Excitation threshold U>>	N/A	N/A	N/A	N/A
	Delay time U>>	N/A	N/A	N/A	N/A
	Excitation threshold U>	N/A	N/A	N/A	N/A
	Delay time U> * 1)	N/A	N/A	N/A	N/A
	Excitation threshold U<	N/A	N/A	N/A	N/A
	Delay time U<	N/A	N/A	N/A	N/A
	Excitation threshold U<<	N/A	N/A	N/A	N/A
	Delay time U<<	N/A	N/A	N/A	N/A
	Excitation threshold f>	N/A	N/A	N/A	N/A
	Delay time f>	N/A	N/A	N/A	N/A
	Excitation threshold f<	N/A	N/A	N/A	N/A
	Delay time f<	N/A	N/A	N/A	N/A
b) name set of parameters (Parameter setup name in manual or software)					
☐ directly coupled synchronous and asynchronous generators with $P_n > 50$ kW	Excitation threshold U>>	N/A	N/A	N/A	N/A
	Delay time U>>	N/A	N/A	N/A	N/A
	Excitation threshold U>	N/A	N/A	N/A	N/A
	Delay time U> * 1)	N/A	N/A	N/A	N/A
	Excitation threshold U<	N/A	N/A	N/A	N/A
	Delay time U<	N/A	N/A	N/A	N/A
	Excitation threshold U<<	N/A	N/A	N/A	N/A
	Delay time U<<	N/A	N/A	N/A	N/A
	Excitation threshold f>	N/A	N/A	N/A	N/A

	Delay time f>	N/A	N/A	N/A	N/A
	Excitation threshold f<	N/A	N/A	N/A	N/A
	Delay time f<	N/A	N/A	N/A	N/A
c) name set of parameters (Parameter setup name in manual or software)					
☒ Inverter	Excitation threshold U>>	GridOverVolt2(V)	--	287,5	N/A
	Delay time U>>	MainsOverVoltProtTime2 (ms)	--	100	N/A
	Excitation threshold U>	GridOverVolt1(V)	--	253,0	N/A
	Delay time U> * 1)	MainsOverVoltProtTime1 (ms) *1)	--	100 *1)	N/A
	Excitation threshold U<	GridUnderVolt1(V)	--	184,0	N/A
	Delay time U<	MainsUnderVoltProtTime1 (ms)	--	3000	N/A
	Excitation threshold U<<	GridUnderVolt2(V)	--	103,5	N/A
	Delay time U<<	MainsUnderVoltProtTime2 (ms)	--	300	N/A
	Excitation threshold f>	GridOverFreq1(Hz)	--	51,5	N/A
	Delay time f>	GridOverFregProtTime1 (ms)	--	100	N/A
	Excitation threshold f<	GridUnderFreq1(Hz)	--	47,5	N/A
	Delay time f<	GridUnderFregProtTime1 (ms)	--	100	N/A
*1) 10-min mean value *2) testing of external NS-protection					

Factory settings correspond to the values according the Inverter of Table 36 of VDE 0124	P
There are no factory settings. The information on the setting values in the instruction manual correspond to those in Inverter of Table 36 of VDE 0124.	N/A
External NS protection: settings and delay times are password protected settable	N/A
External NS protection: It is possible to read the setting values without a tool	N/A
Integrated NS protection: the setting values are visible via a data interface or display	P
The limit values for U> can be set between 110% and 115% and, in the case of directly coupled synchronous and asynchronous generators with P_{rE} >50kW, the time delay for U< and U<< can be set. All other limit values are protected against unauthorized access.	P

5.5.7.3 Wiring check	N/A
5.5.7.3.1 Test	N/A

Test procedural:

- The wiring of the test object must be checked by applying the test voltages.
- For single-phase EZE, the wiring test is adapted, only the feed-in phase is to be evaluated.
- It must be checked that the test object correctly evaluates line to line voltages and line to neutral conductor voltages. This test step is not applicable for single-phase EZE.

Assessment criterion:

This check is not evaluated. If a phase rotation is detected, it shall be corrected and the test repeated.

Note:

Wiring Test Voltage Monitoring and Frequency Monitoring

Setting values:

Phase	Voltage [Vac]	Phase angle [°]	Frequency [Hz]
U L1-E	--	--	--
U L2-E	--	--	--
U L3-E	--	--	--

Measured values:

Phase	Voltage [Vac]	Phase angle [°]	Frequency [Hz]
U L1-E	--	--	--
U L2-E	--	--	--
U L3-E	--	--	--

Checking Voltage Reference Voltage Monitoring and Frequency Monitoring

Setting values:

Phase	Voltage [Vac]	Phase angle [°]	Frequency [Hz]
U L1-E	--	--	--
U L2-E	--	--	--
U L3-E	--	--	--

Measured values:

Phase	Voltage [Vac]	Phase angle [°]	Frequency [Hz]
U L1-E	--	--	--
U L2-E	--	--	--
U L3-E	--	--	--

5.5.7.4	Voltage and frequency control	P
5.5.7.4.1	Voltage and frequency control – Single Phase	P

Test procedural:

- For a single-phase EZE, only the feed-in phase needs to be checked.
- Before each test step, the EZE must be operated symmetrically with rated voltage and rated frequency for at least 10 s in feed-in mode.
- The P setpoint was set by RS485 port.

Assessment criterion:

- The permitted tolerance between setting value and trip value of the voltage may not exceed ± 1% of Un.
- The disconnection time includes disconnect time + operate time of the integrated relay. Therefore, limit is given with +0,100s according to Table 2 set values of the NS-protection according to VDE AR-N 4105:2018.

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Integrated NS protection single-phase ≤30kVA

	Setting	Value [V]	Time [s]	Setting	Value [V]	Time [s]
Setting values of the NS protection:	U>>	287,5	0,1			
	U<	184,0	3,0	U<<	103,5	0,3

Operating time of the monitoring device:

CME06-2BM250

L to N:	**Under voltage AU< (4.4):**			**Over voltage AU>> (1.4):**		
Ramp [start V to stop V]	>188,6 → <179,4			<282,9 → >292,1		
Step size [V]	<1,15			<1,15		
Step length [s]	>3,200			>0,400		
Limit [V]	184,0 ±1% U_n			287,5 ±1% U_n		
Measurement [V]	184,2	183,8	183,7	288,5	289,4	289,1

L to N:	**Under voltage tU< (5.4):**			**Over voltage tU>> (2.4):**		
Jump [start V to stop V]	>200,1 → <179,4			<282,9 → >292,1		
Step size [V]	>9,2			>9,2		
Step length [s]	>3,200			>0,400		
Limit [s]	3,000 ≤t ≤3,100			0,100 ≤t ≤0,200		
Measurement [s]	3,040	3,020	3,020	0,131	0,123	0,134

L to N:	**Under voltage AU<< (6.4):**		
Ramp [start V to stop V]	>108,1 → <98,9		
Step size [V]	<1,15		
Step length [s]	>0,500		
Limit [V]	103,5 ±1% U_n		
Measurement [V]	102,5	102,5	102,5

L to N:	**Under voltage tU<< (7.4):**
Jump [start V to stop V]	>108,1 → <98,9
Step size [V]	>9,2

5.5.7.4	Voltage and frequency control	P
5.5.7.4.1	Voltage and frequency control – Single Phase	P

Test procedural:

- For a single-phase EZE, only the feed-in phase needs to be checked.
- Before each test step, the EZE must be operated symmetrically with rated voltage and rated frequency for at least 10 s in feed-in mode.
- The P setpoint was set by RS485 port.

Assessment criterion:

- The permitted tolerance between setting value and trip value of the voltage may not exceed ± 1% of Un.
- The disconnection time includes disconnect time + operate time of the integrated relay. Therefore, limit is given with +0,100s according to Table 2 set values of the NS-protection according to VDE AR-N 4105:2018.

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Integrated NS protection single-phase ≤30kVA

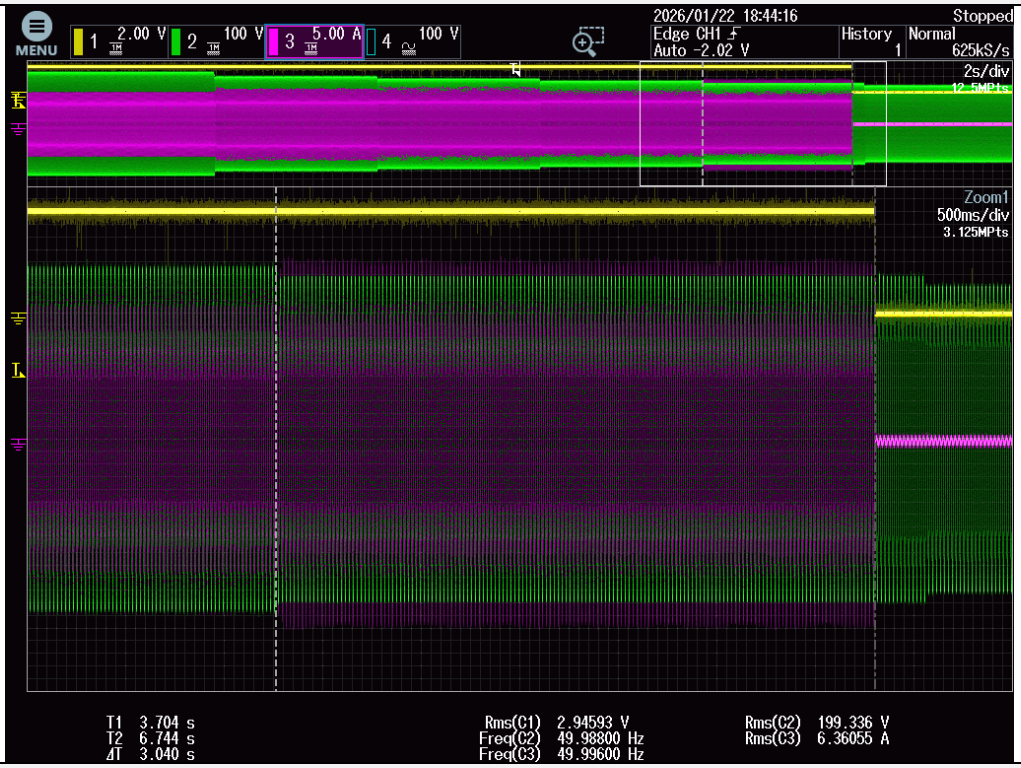
	Setting	Value [V]	Time [s]	Setting	Value [V]	Time [s]
Setting values of the NS protection:	U>>	287,5	0,1			
	U<	184,0	3,0	U<<	103,5	0,3

Operating time of the monitoring device:

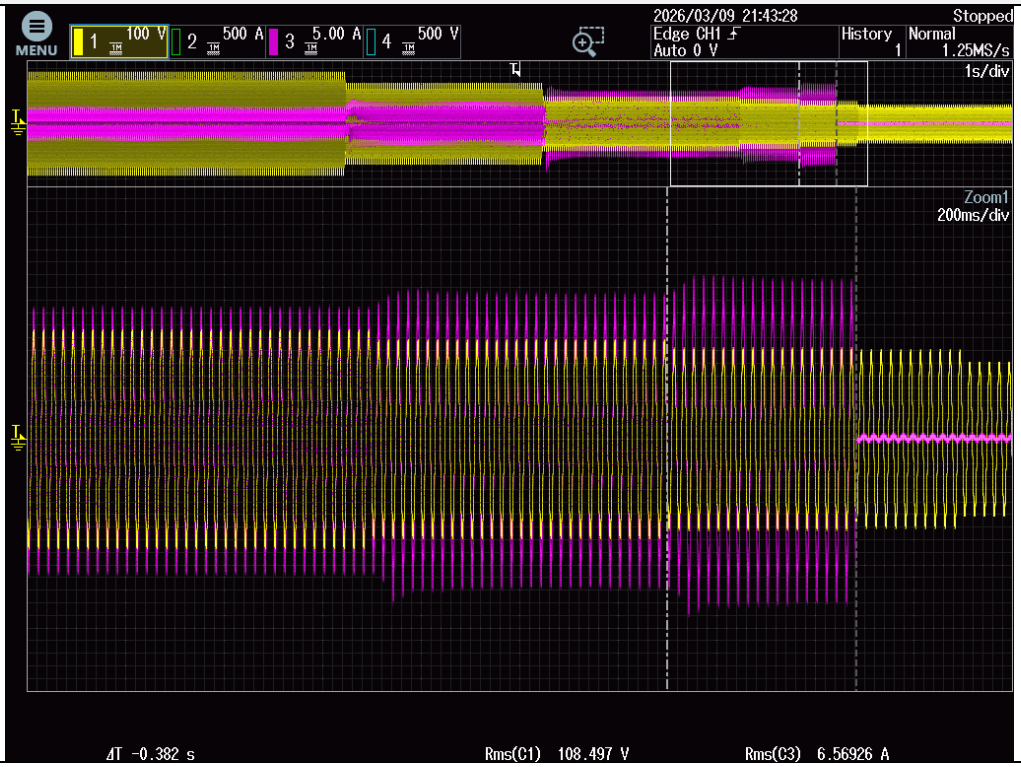
CME06-2BM250

Step length [s]	>0,500			
Limit [s]	0,300 ≤t ≤0,400			
Measurement [s]	0,380	0,374	0,382	

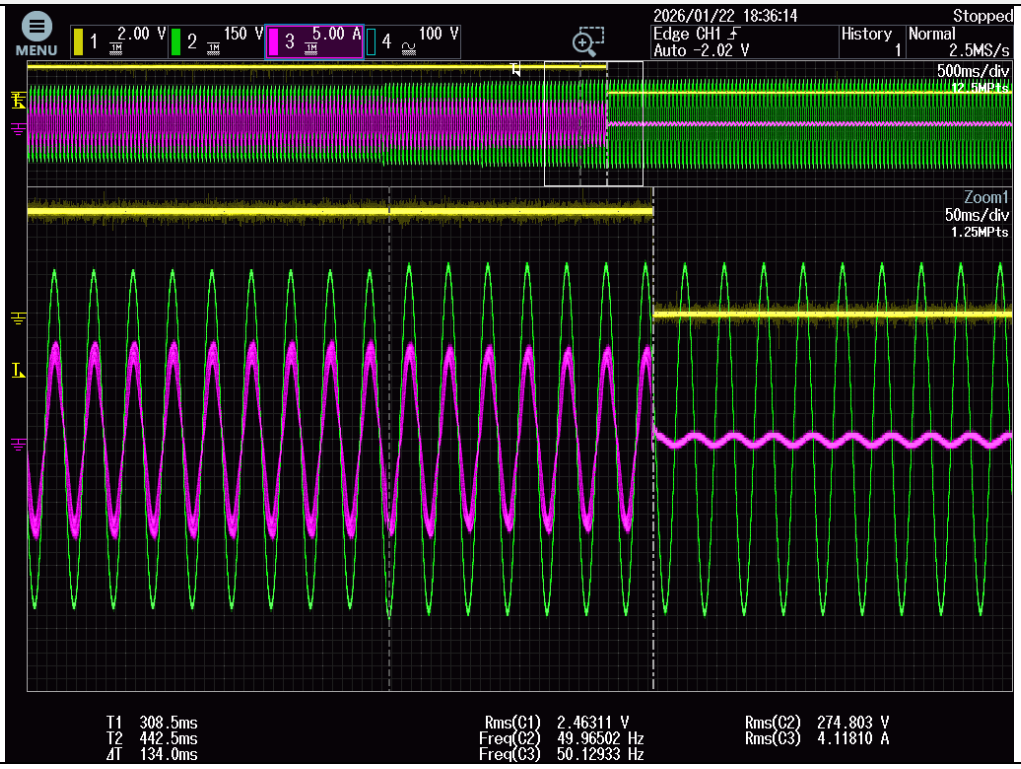
Under voltage AU<: L to N:



Under voltage AU<<: L to N:

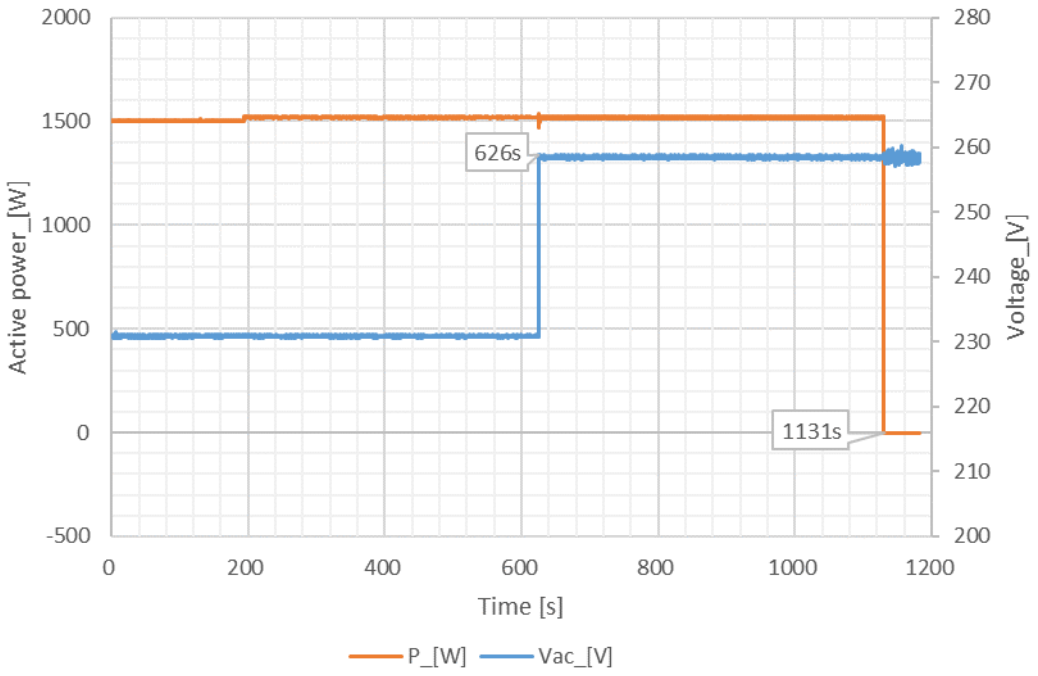


Over voltage AU>>: L to N:

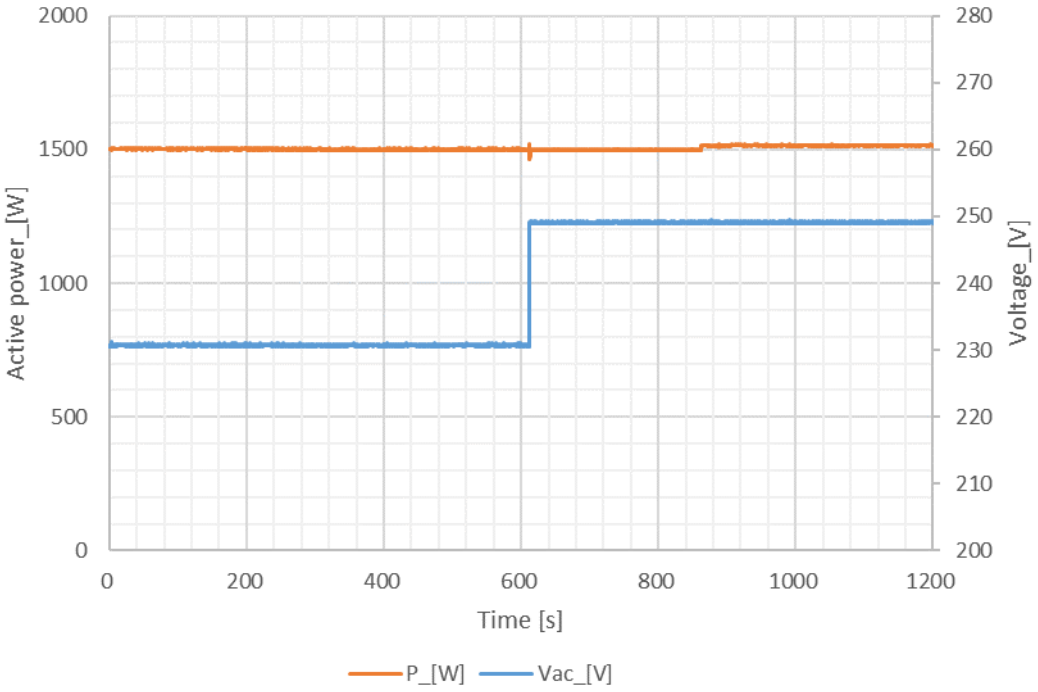


5.5.7.4 Voltage and frequency control			**P**
5.5.7.4.1 Measuring the rise-in voltage protection as a running 10-minute mean value			**P**
Setting values of the NS protection:	Setting U> [V]	253,0	
	Setting $T_{disconnection\ U>}$ [s]	600	
Note: The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.			
Operating time of the monitoring device:			
L-N:	**Over voltage 10-minute mean value (3.1):**		
Ramp [start V to stop V]	230,0 → 257,6		
Step size [V]	27,6		
Step length [s]	>600,2		
Limit for disconnection [s]	450 to 550		
Measurement [s]	505s		
L-N:	**Over voltage 10-minute mean value (3.2):**		
Ramp [start V to stop V]	230,0 → >248,4		
Step size [V]	18,4		
Step length [s]	>600,2		
Limit for reconnection [s]	no disconnection (also after 600s)		
Measurement [s]	No disconnection		
L-N:	**Over voltage 10-minute mean value (3.3):**		
Ramp [start V to stop V]	243,8 → >262,2		
Step size [V]	18,4		
Step length [s]	>600,2		
Limit for disconnection[s]	225s to 375		
Measurement [s]	299s		

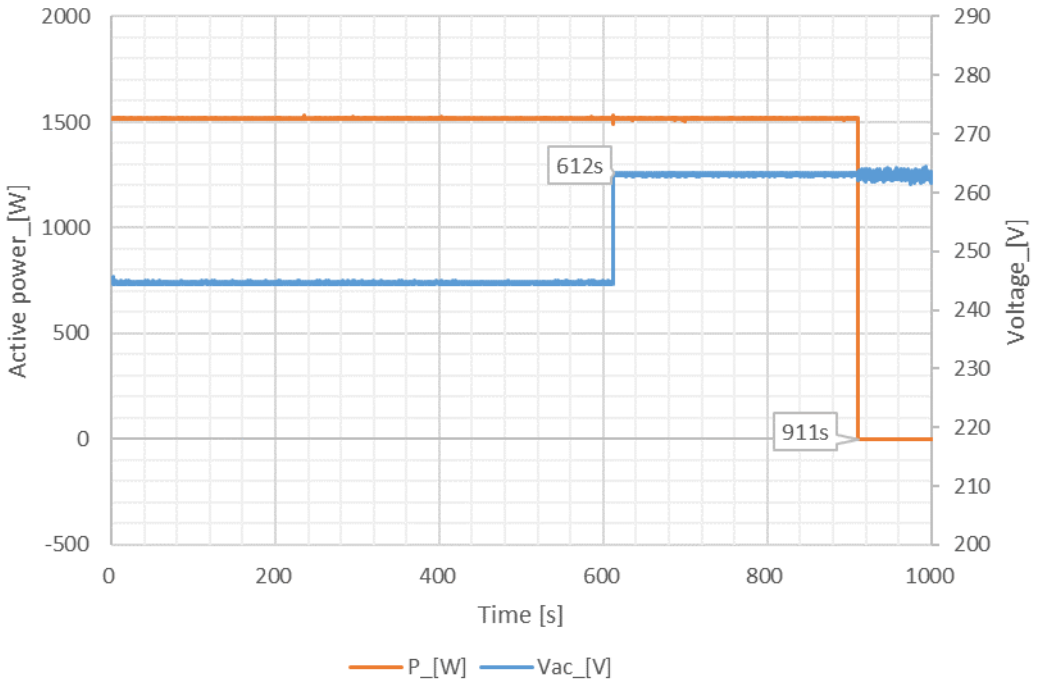
Over voltage 10-minute mean value (3.1):



Over voltage 10-minute mean value (3.2):



Over voltage 10-minute mean value (3.3):



5.5.7.4 Voltage and frequency control	P
5.5.7.4.1 Voltage and frequency control – Frequency measurement	P

Test procedural:

- For a single-phase EZE, only the feed-in phase needs to be checked.
- Before each test step, the EZE must be operated symmetrically with rated voltage and rated frequency for at least 10 s in feed-in mode.
- The P setpoint was set by RS485 port.

Assessment criterion:

- The permitted tolerance between setting value and trip value of the voltage may not exceed ± 0,1% of f_n.
- The disconnection time includes disconnect time + operate time of the integrated relay. Therefore, limit is given with +0,100s according to Table 2 set values of the NS-protection according to VDE AR-N 4105:2018.

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

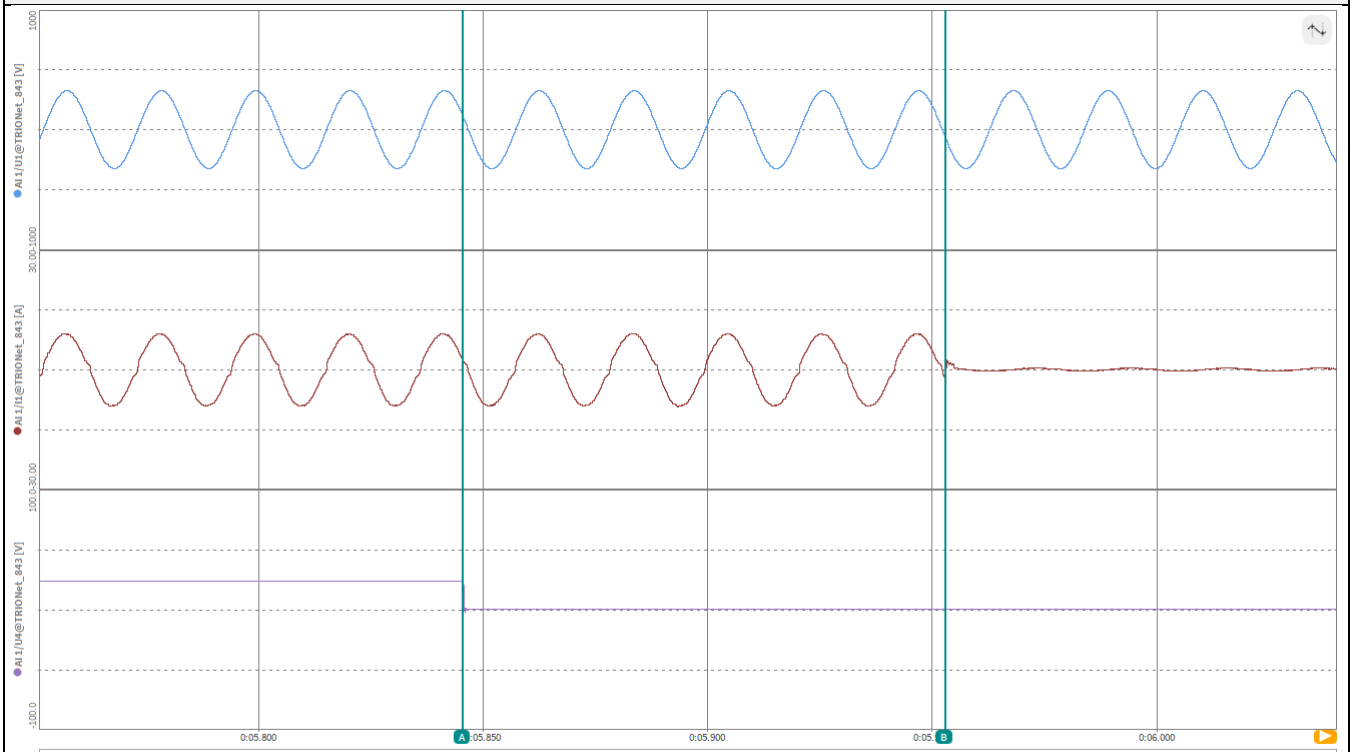
	Setting	Value [Hz]	Time [s]
Setting values of the NS protection:	f<	47,5	0,1
	f>	51,5	0,1

Operating time of the monitoring device:

	Under frequency Af< (10.1):			**Over frequency Af>(8.1):**		
Ramp [start Hz to stop Hz]	47,60 → 47,40			51,40 → 51,60		
Step size [Hz]	<0,025			<0,025		
Step length [s]	>0,4			>0,4		
Limit [Hz]	47,50 ±0,1% f_n			51,50 ±0,1% f_n		
Measurement [Hz]	47,52	47,52	47,52	51,50	51,50	51,52

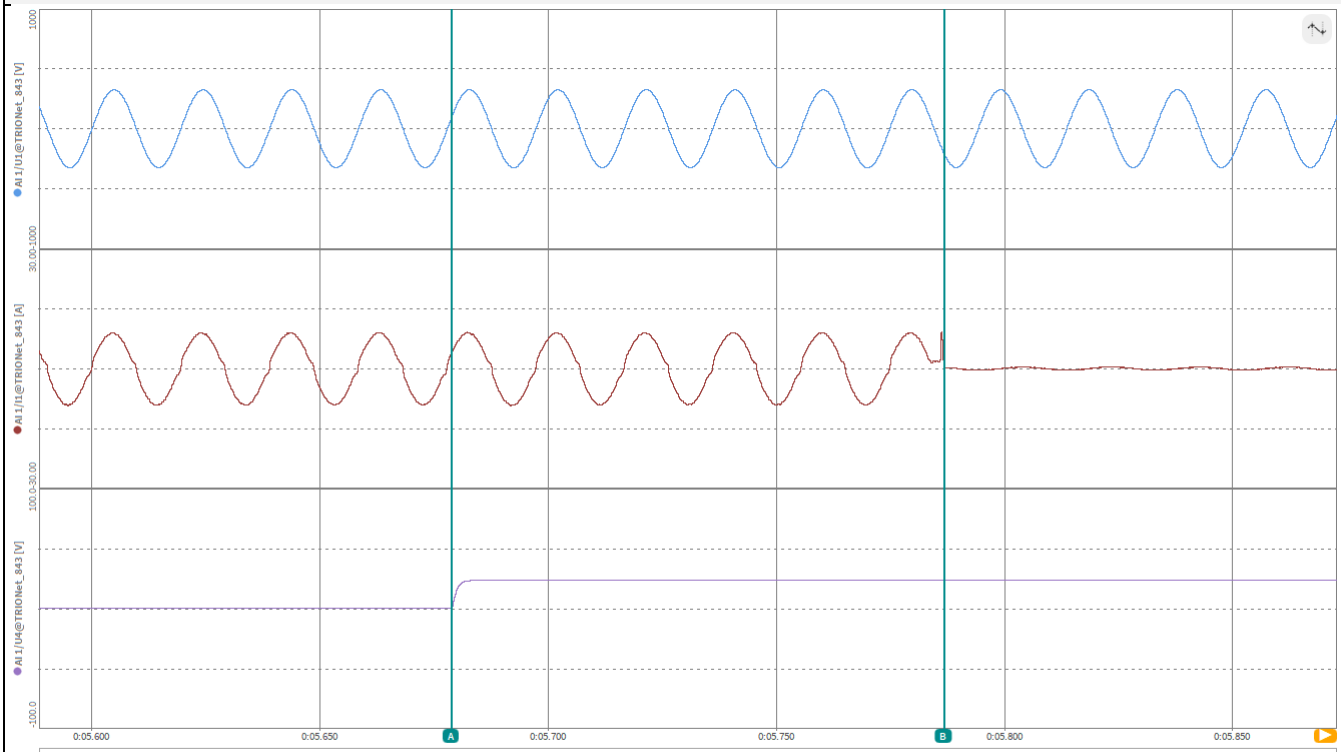
	Under frequency Tf< (11.1):			**Over frequency Tf> (9.1):**		
Jump [start Hz to stop Hz]	47,60 → 47,40			51,40 → 51,60		
Step size [Hz]	>0,2			>0,2		
Step length [s]	>0,4			>0,4		
Limit [s]	0,100 ≤t ≤0,200			0,100 ≤t ≤0,200		
Disconnection time [s]	0,105	0,107	0,107	0,105	0,108	0,107

Under frequency Af< (11.1):



时间 [s]	A 5.8454296	B 5.9527562	间隔 0.1073267
AI 1/U1@TRIONet_843 [V]	113.2236	-59.39627	-172.6198
AI 1/I1@TRIONet_843 [A]	2.156094	-2.448365	-4.604459
AI 1/U4@TRIONet_843 [V]	23.67187	0.057459	-23.61441

Over frequency Af> (9.1):



时间 [s]	A 5.6788494	B 5.7867546	间隔 0.1079052
AI 1/U1@TRIONet_843 [V]	98.70291	-218.8845	-317.5874
AI 1/I1@TRIONet_843 [A]	4.258946	0.264242	-3.994704
AI 1/U4@TRIONet_843 [V]	0.066280	23.60368	23.53740

5.5.7.5 Reporting NS protection	P

Test procedural:

- At least the last 5 error messages can be read at the EZE or the external NA protection.
- The supply voltage must then be interrupted for 3 s.
- The error messages must then be read out again.

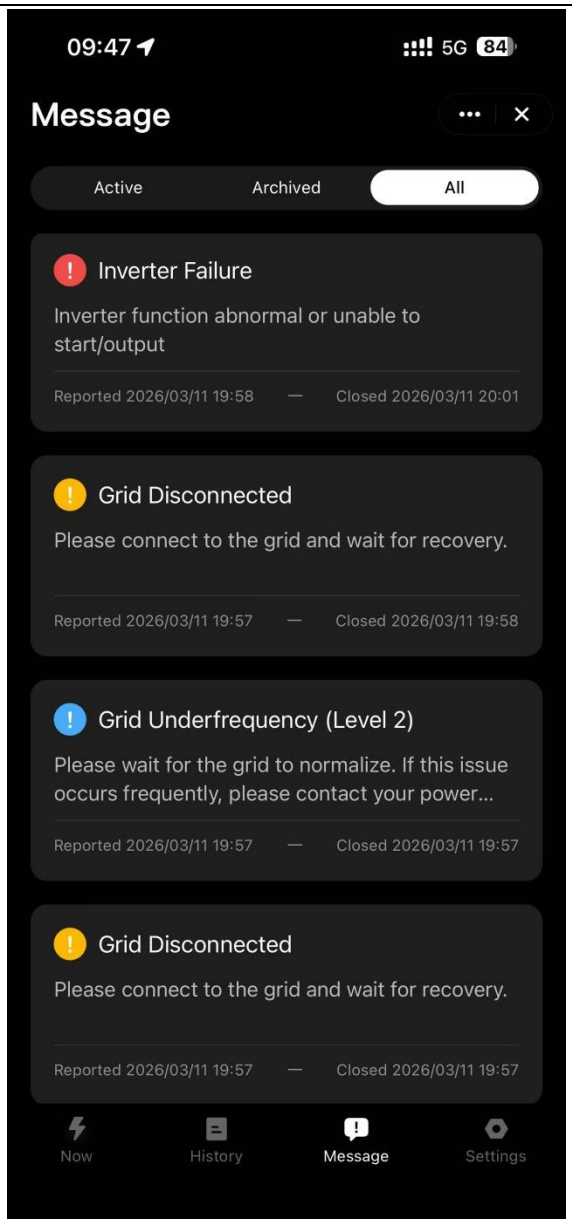
Assessment criterion:

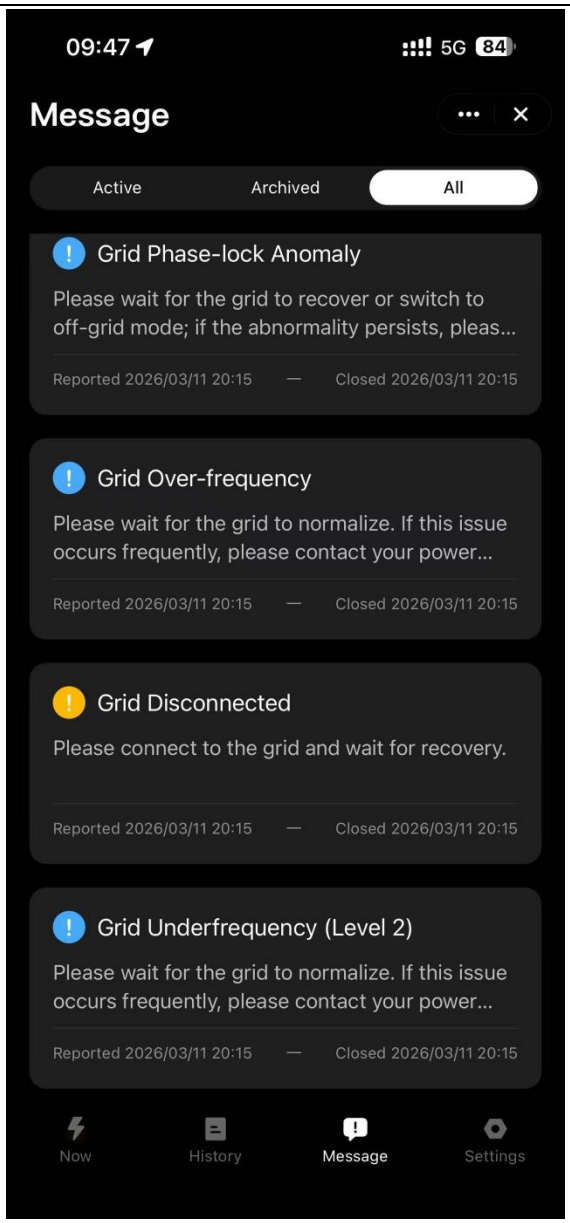
At least the last 5 error messages including time stamps that were recorded before the voltage interruption and at least 5 error messages including time stamps that were recorded after the voltage interruption must be documented.

Note:

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Picture of 5 last dated failure:





5.5.9 Constructional characteristics of NS protection	**P**
5.5.9.1 General	**P**
These tests serve to demonstrate the requirements of VDE-AR-N 4105: 2018-11, 6.5.2.	
5.5.9.2 Test	**P**
Type of NS protection: ☒Internal / ☐external	
NS-protection is sealed or a password protection is used (or both)	P
adjustability of U> and the time delays for U< and U<< is given	P
All other protective functions are either permanently protected or protected from unauthorized access by additional, separate protection (example password)	P

5.5.10 Islanding detection	P
For power generation systems, islanding detection must be carried out using one of the following processes: a) active method, e.g., by means of frequency – shift process (oscillating circuit) b) passive method by means of the three-phase voltage monitoring (possible only for power generation systems without inverters or for single-phase power generation units with inverters). (see 5.4.5.3 3-phase voltage control) With the passive process, it is important to provide evidence that the power generation unit can be set not equal to 120°.	
5.5.10.1 General	**P**
These tests serve as proof of the requirements of VDE-AR-N 4105: 2018-11, 6.5.3. The maximum switch-off time is 9 s.	

5.5.10.2 Passive Islanding detection	N/A
The passive procedure is implemented by the voltage increase and voltage decrease protection of the NS protection.	
Note: A passive procedure is possible with the help of three-phase voltage monitoring (only for generating units without converter or for single-phase generating units with converter) The three-phase voltage monitoring is also permissible with the structural integration of several single-phase generating units that feed into different external conductors, as long as the currents of these generating units are regulated independently of each other so that any phase positions can be set.	

5.5.10.3 Islanding protection according to table 6 - Load imbalance (real, reactive load) for test condition A (PGU output = 100%)	**P**
Test conditions	Frequency: 50 ±1% f_n U_n = 230 ±1%U_n Distortion factor of chokes ≤2%
Disconnection limit	2s (IEC 62116)

No	P_{PGU} [1] [% of PGU rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	P_{PGU} [W]	V_{DC} [V]#	Q_f [1]	Run on Time [ms]	Re-marks[5]
1	100	100	0	0	1500	25,6	1,001	908	Test A at BL
2	100	100	-5	-5	1500	25,6	1,027	163	Test A at IB
3	100	100	-5	0	1500	25,6	1,053	778	Test A at IB
4	100	100	-5	+5	1500	25,6	1,079	776	Test A at IB
5	100	100	0	-5	1500	25,6	0,975	159	Test A at IB
6	100	100	0	+5	1500	25,6	1,025	763	Test A at IB
7	100	100	+5	-5	1500	25,6	0,929	147	Test A at IB
8	100	100	+5	0	1500	25,6	0,953	714	Test A at IB
9	100	100	+5	+5	1500	25,6	0,977	606	Test A at IB

Parameter at 0%	L= 111,26mH	R= 33,47 Ω	C= 99,54 µF
I_{AC} [4] [A]	0,032		

Note:

RLC is adjusted to min. +/-1% of the inverter rated output power

[1] P_{PGU}: PGU output power

[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from PGU to utility. Nominal is the 0 % test condition value.

[3] Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from PGU to utility. Nominal is the 0 % test condition value.

[4] Fundamental of I_{AC} when RLC is adjusted

[5] BL: Balance condition, IB: Imbalance condition.

Condition A:

PGU output power P_{PGU} = Maximum [6]

PGU input voltage [6] ≥ 75% of rated input voltage range

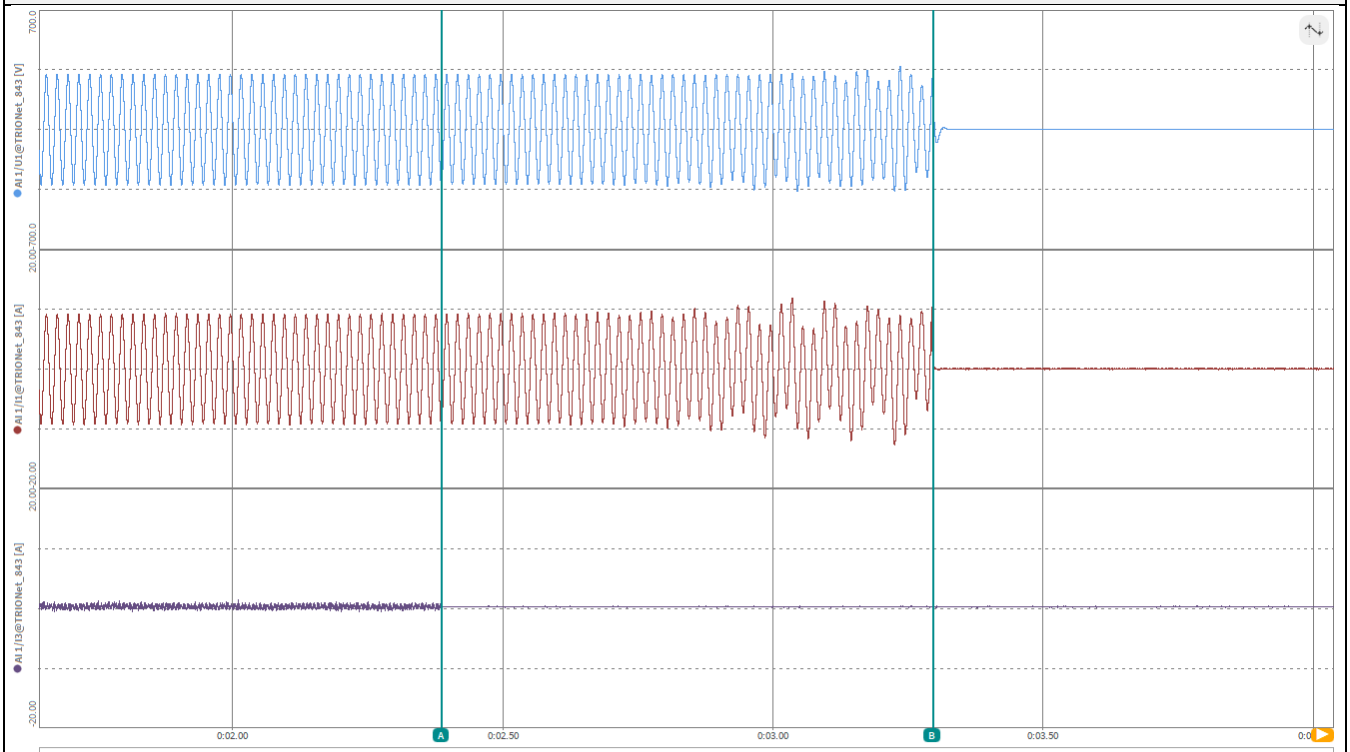
[6] Maximum PGU output power condition should be achieved using the maximum allowable input power. Actual output power may exceed nominal rated output.

[7] Based on PGU rated input operating range. For example, If range is between X volts and Y volts, 75 % of range =X + 0,75 × (Y – X). Y shall not exceed 0,8 × PGU maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the PGU should not be operated outside of its allowable input voltage range.

Use the rated input voltage of the all-in-one machine 25.6V for testing.

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Disconnection at P_{AC} 0% & Q_{AC} 0%



	A	B	间隔
时间 [s]	2.387569	3.295527	0.907958
AI 1/U1@TRIONet_843 [V]	-322.9053	294.8251	617.7304
AI 1/I1@TRIONet_843 [A]	-9.305461	2.964752	12.27021
AI 1/I3@TRIONet_843 [A]	0.214363	0.257279	0.042915

5.5.10.3 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition B (PGU output = 50 % – 66 %)	P

Test conditions	Frequency: 50 ±1% f_n U_n = 230 ±1%U_n Distortion factor of chokes ≤2%
Disconnection limit	2s (IEC 62116)

No	P_{PGU} [1)] [% of PGU rating]	Reactive load [% of Q_L in 6.1.[d)1]]	P_{AC} [2)] [% of nominal]	Q_{AC} [3)] [% of nominal]	P_{PGU} [W]	V_{DC} [V]#	Q_f [1]	Run on Time [ms]	Re-marks[5)]
10	66	66	0	-5	990	25,6	0,975	189	Test B at IB
11	66	66	0	-4	990	25,6	0,980	707	Test B at IB
12	66	66	0	-3	990	25,6	0,985	804	Test B at IB
13	66	66	0	-2	990	25,6	0,990	513	Test B at IB
14	66	66	0	-1	990	25,6	0,995	912	Test B at IB
15	66	66	0	0	990	25,6	1,000	910	Test B at BL
16	66	66	0	1	990	25,6	1,005	687	Test B at IB
17	66	66	0	2	990	25,6	1,010	774	Test B at IB
18	66	66	0	3	990	25,6	1,015	837	Test B at IB
19	66	66	0	4	990	25,6	1,020	649	Test B at IB
20	66	66	0	5	990	25,6	1,025	557	Test B at IB

Parameter at 0%	L= 169,57 mH	R= 50,95 Ω	C= 65,31 µF
I_{AC} [4)] [A]	0,047		

Note:

RLC is adjusted to min. +/-1% of the inverter rated output power

[1)] P_{PGU}: PGU output power

[2)] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from PGU to utility. Nominal is the 0 % test condition value.

[3)] Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from PGU to utility. Nominal is the 0 % test condition value.

[4)] Fundamental of I_{AC} when RLC is adjusted

[5)] BL: Balance condition, IB: Imbalance condition.

Condition B:

PGU output power P_{PGU} = 50 % – 66 % of maximum

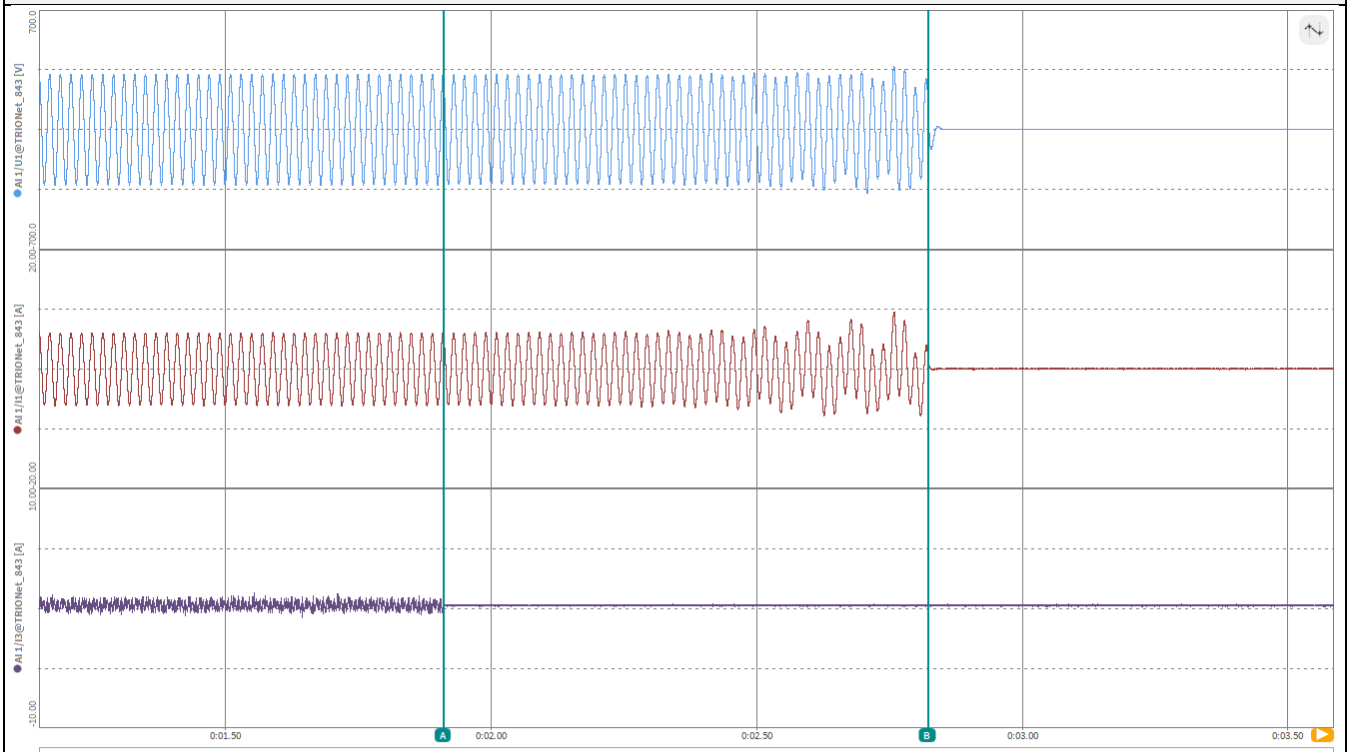
PGU input voltage [6)] = 50 % of rated input voltage range, ±10 %

[6)] Based on PGU rated input operating range. For example, If range is between X volts and Y volts, 50 % of range =X + 0,5 × (Y – X). Y shall not exceed 0,8 × PGU maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the PGU should not be operated outside of its allowable input voltage range.

Use the rated input voltage of the all-in-one machine 25.6V for testing.

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Disconnection time at P_{AC} 0% and Q_{AC} -1%



	A	B	间隔
时间 [s]	1.910737	2.822415	0.911678
AI 1/U1@TRIONet_843 [V]	325.2568	188.3171	-136.9398
AI 1/I1@TRIONet_843 [A]	6.006378	2.115386	-3.890991
AI 1/I3@TRIONet_843 [A]	0.130321	0.244762	0.114441

5.5.10.3 Islanding protection according Table 8 – Load imbalance (reactive load) for test condition C (PGU output = 25 % – 33 %)									**P**
Test conditions			Frequency: 50 ±1% f_n U_n = 230 ±1%U_n Distortion factor of chokes ≤2%						
Disconnection limit			2s (IEC 62116)						
No	P_{PGU} [1] [% of PGU rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	P_{PGU} [W]	V_{DC} [V]#	Q_f [1]	Run on Time [ms]	Re-marks[5]
21	33	33	0	-5	495	25,6	0,975	162	Test C at IB
22	33	33	0	-4	495	25,6	0,980	651	Test C at IB
23	33	33	0	-3	495	25,6	0,985	605	Test C at IB
24	33	33	0	-2	495	25,6	0,990	970	Test C at IB
25	33	33	0	-1	495	25,6	0,995	867	Test C at IB
26	33	33	0	0	495	25,6	1,000	704	Test C at BL
27	33	33	0	1	495	25,6	1,005	743	Test C at IB
28	33	33	0	2	495	25,6	1,010	699	Test C at IB
29	33	33	0	3	495	25,6	1,015	643	Test C at IB
30	33	33	0	4	495	25,6	1,020	779	Test C at IB
31	33	33	0	5	495	25,6	1,025	736	Test C at IB
Parameter at 0%			L= 338,12 mH		R= 101,61 Ω			C= 32,75 µF	
I_{AC} [4] [A]			0,042						

Note:

RLC is adjusted to min. +/-1% of the inverter rated output power

[1] P_{PGU}: PGU output power

[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from PGU to utility. Nominal is the 0 % test condition value.

[3] Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from PGU to utility. Nominal is the 0 % test condition value.

[4] Fundamental of I_{AC} when RLC is adjusted

[5] BL: Balance condition, IB: Imbalance condition.

Condition C:

PGU output power P_{PGU} = 25 % – 33 % [6] of maximum

PGU input voltage [7] < 20 % of rated input voltage range

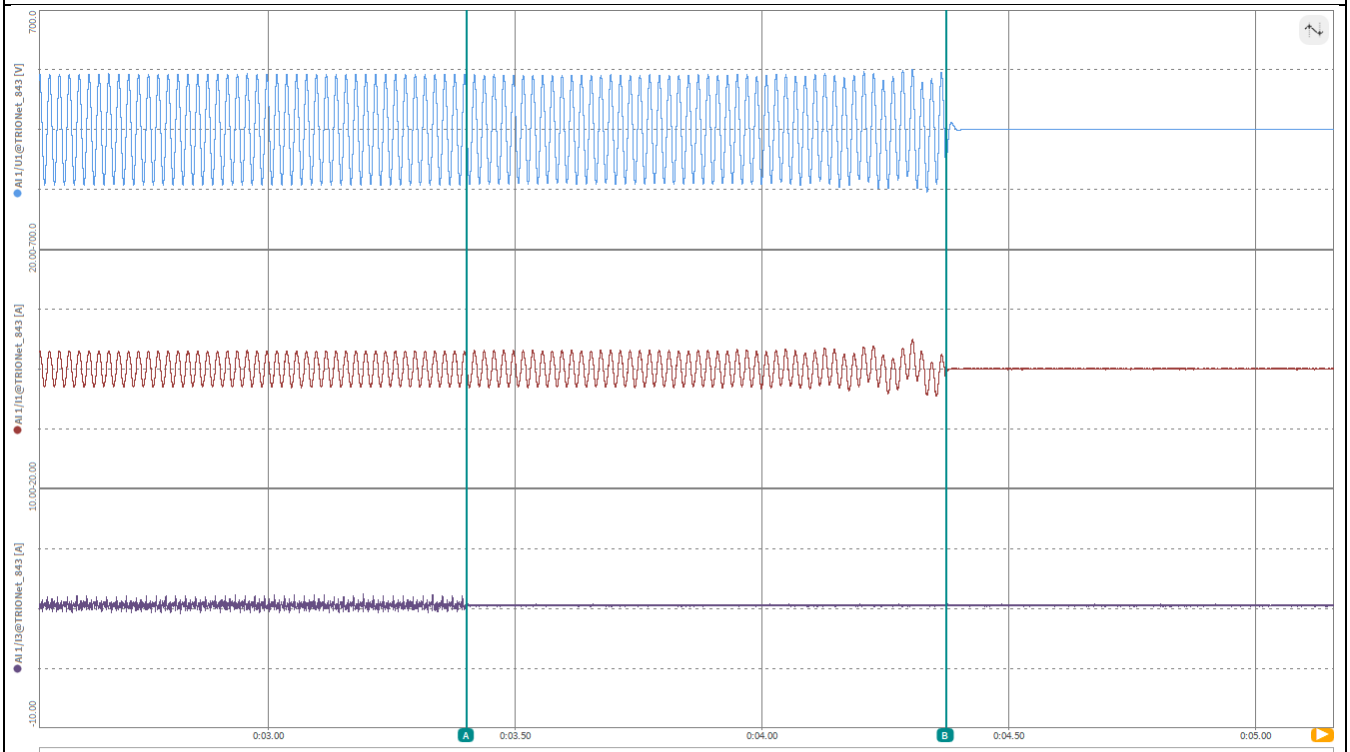
[6] Or minimum allowable PGU output level if greater than 33 %.

[7] Based on PGU rated input operating range. For example, If range is between X volts and Y volts, 20 % of range =X + 0,2 × (Y – X). Y shall not exceed 0,8 × PGU maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the PGU should not be operated outside of its allowable input voltage range.

Use the rated input voltage of the all-in-one machine 25.6V for testing.

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

Disconnection time at P_{AC} 0% and Q_{AC} -2%



	A	B	间隔
时间 [s]	3.401805	4.372160	0.970355
AI 1/U1@TRIONet_843 [V]	97.37301	-217.7935	-315.1665
AI 1/I1@TRIONet_843 [A]	1.013892	-1.523478	-2.537370
AI 1/I3@TRIONet_843 [A]	0.235821	0.235821	0.000000

5.6.2. Connecting conditions and synchronisation				P
Test: CME06-2BM250				
	f_{ist}	**Reset time:**	**Limit:**	
Connecting conditions for frequencies:				
a)	<47,45Hz	No reconnection	No resetting allowed	
	Switch to:			
b)	≥47,55Hz	67 s	≥60s	
c)	>50,15Hz	No reconnection	No resetting allowed	
	Switch to:			
d)	≤50,05Hz	72 s	≥60s	
Connecting conditions for voltages:				
e)	84%	No reconnection	No resetting allowed	
	Switch to:			
f)	≥86%	61 s	≥60s	
g)	111%	No reconnection	No resetting allowed	
	Switch to:			
h)	≤109%	69 s	≥60s	

Test:

see points a) to h) for the test process.

The measurement was carried out with a programmable AC source.

e.g. connecting conditions for frequencies: Point a) and b). The AC source was programmed in such a way that the first step of 230V/50Hz to 230V/47,0Hz resulted in a faulty disconnection. Thereafter the voltage and frequency for 100s is set to 230V/47,45Hz. Switching on again is not permitted. After a lapse of 100s the voltage is set to 230V/47,55Hz. Setting again after 60s is permitted.

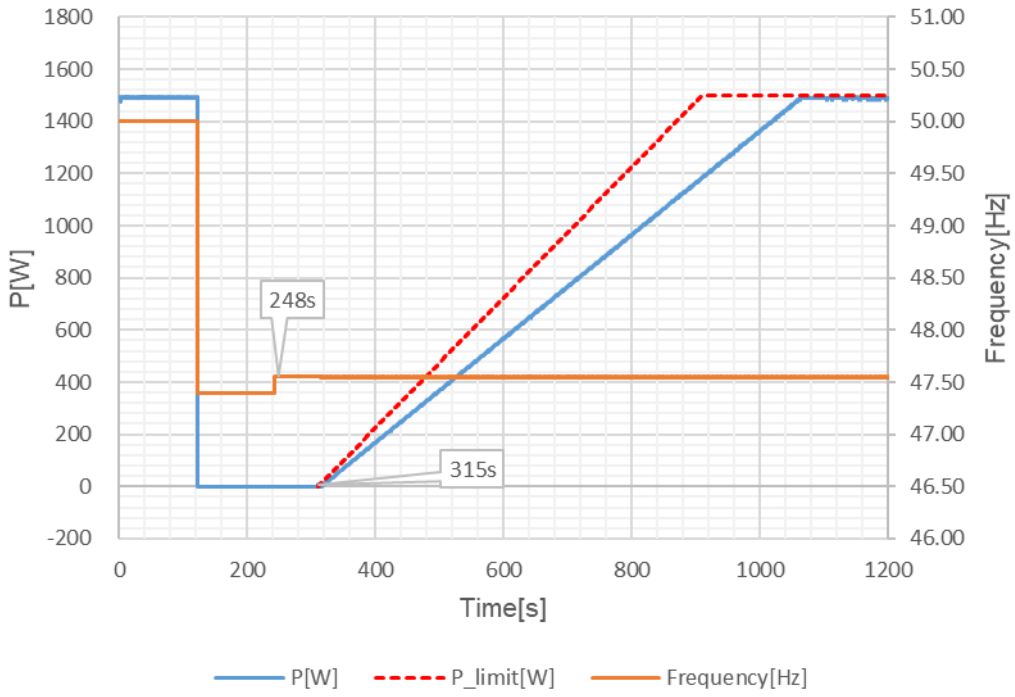
Assessment criterion:

After actuating the NS protection, it should be checked that the system can only be switched within the tolerance ranges ((80% $U_n \leq U \leq 110\%$ U_n) and (47,50Hz ≤f ≤50,10Hz)) at the earliest after 60s after voltage and frequency has remained within the tolerance ranges.

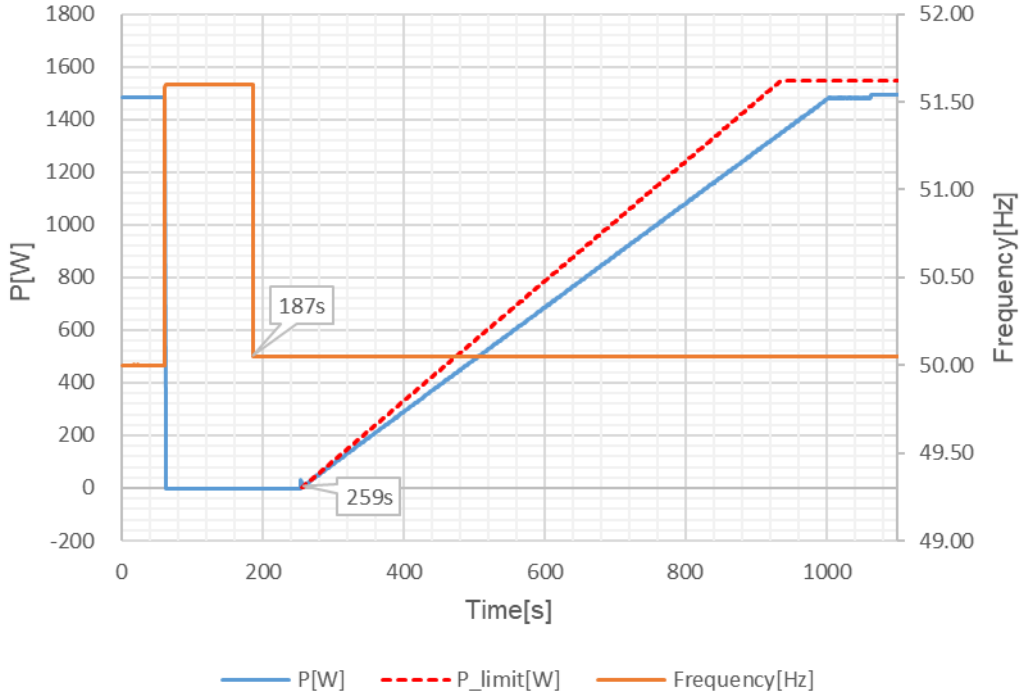
Note:

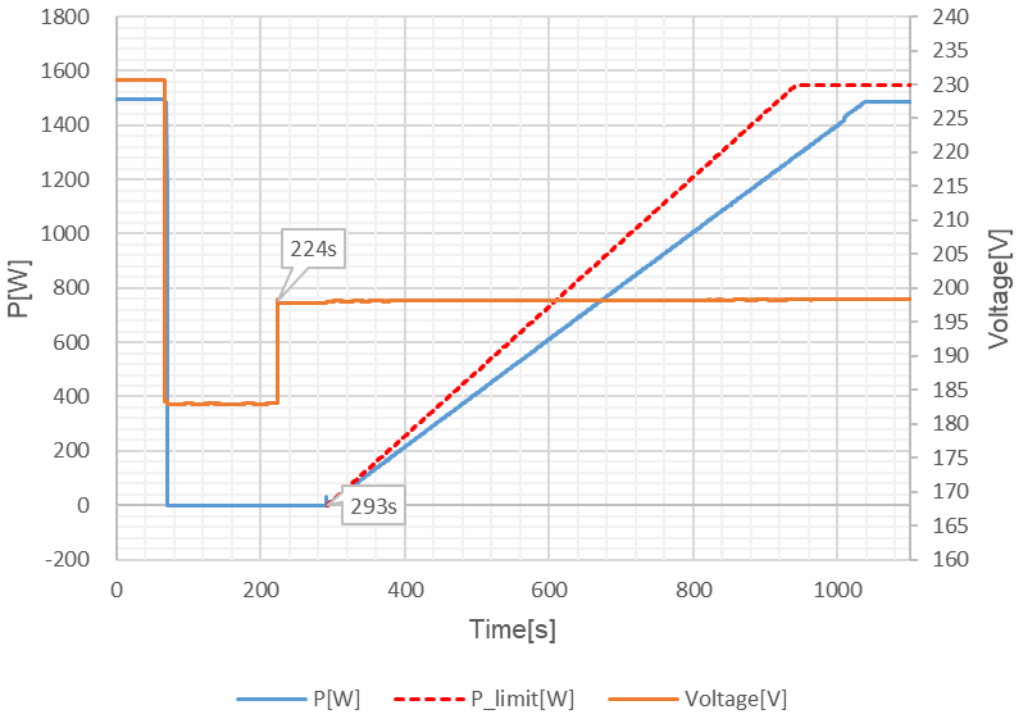
The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

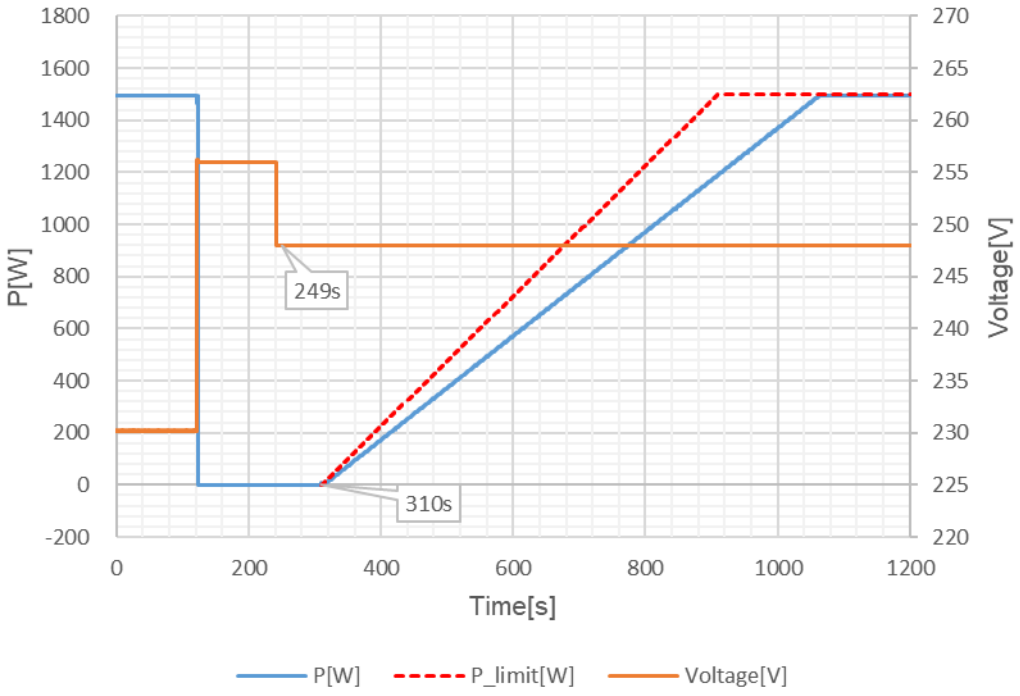
Connecting conditions for frequencies: 47,55Hz



Connecting conditions for frequencies: 50,05Hz



Connecting conditions for voltages: 86%Un


Connecting conditions for voltages: 109%Un


5.7 Evidence of $P_{AV,E}$ -Control

5.7.1 General — P

The test serves to prove the requirements of VDE-AR-N 4105: 2018 - 11, 5.5.2. The $P_{AV,E}$-monitoring may, but does not have to be integrated into the PGU. If the $P_{AV,E}$-monitoring is not as a unit built, but distributed over several devices, the entire impact chain is analogous to the examination of NA protection including the communicative Check coupling.

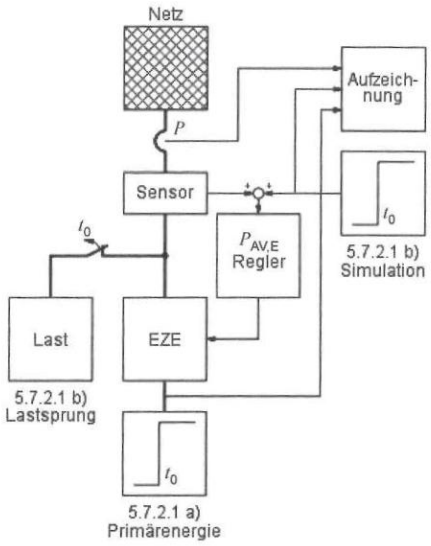


Bild 8 – Skizze des Prüfaufbaus zur Prüfung der Regeldynamik

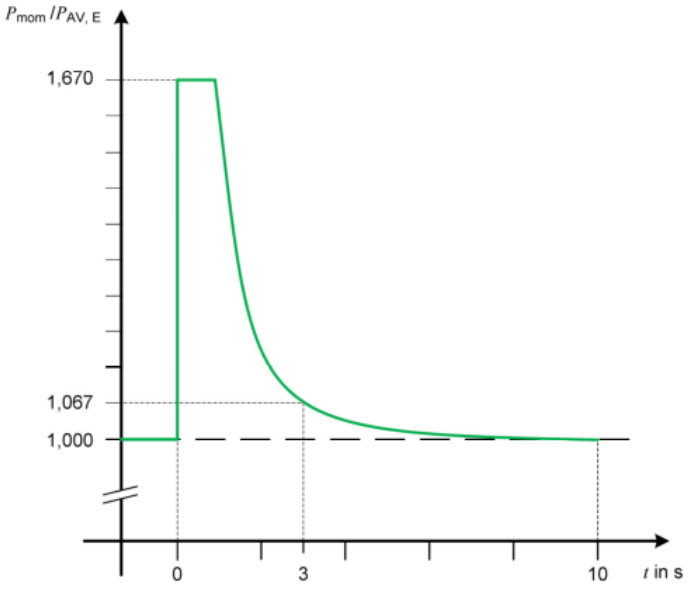


Bild 1 – Wirkleistungs-Grenzkurve für Erzeugungsanlagen

The PGU with any necessary additional components is installed according to the manufacturer's instructions and parameterized so that the feed limitation $P_{AV,E}$ is activated at ≥ 60% P_{rE}. The power jump can be simulated either by a jump in the primary energy supply or by the fall of a load become:

a) Loss of load: The PGU is operated at nominal power. Via a load which is to be connected symmetrically to all feeding phases parallel to the PGU, the power at the grid connection point is set to $P_{AV,E}$ with a tolerance of -2%. At time t0, the load is switched off. The elimination of the load can also be simulated by an appropriate offset on the power measurement signal.

b) Primary energy supply jump: The primary energy supply is adjusted so that the PGU supplies the power $P_{AV,E}$ = 60% P_{rE} with a tolerance of -2%. At the time t0, the primary energy supply is to be suddenly increased so that the PGU can provide the rated output.

The closed loop must not be disconnected. Here, the sum of the effective active values of all 3 phases at the grid connection point must be recorded for at least 15s from the power jump.

5.7.2.1 Test of control the dynamic
Parameter setting for testing The $P_{AV,E}$ -control power was setting to 60%PrE through the parameter settling limitation feed power of maximum total system power of smart power meter.
For step descripted of testing Test a): Loss of load setting: a) Adjust load with 40%PrE at least with a tolerance of +2% to make the active power at the meter position to be $P_{AV,E}$ =60%PrE with a tolerance of −2%. b) Waiting for the output power were stabilizing (keep at lease 60s) then sudden disconnected the load. Test b): Primary energy supply jump c) The primary energy supply is set so that the EZE feeds the power $P_{AV,E}$ = 60% P_{rE} with a tolerance of −2%. d) At time t0, the primary energy supply has to be increased by leaps and bounds so that the EZE can provide the nominal output. e) Waiting for the output power were stabilizing (keep at lease 60s) then sudden added the primary supply to nominal power of EZE.
Assessment criterion: The test in accordance with 5.7.2.1 is considered passed if the active power measured at the grid connection point does not exceed the limit curve in VDE-AR-N 4105:2018-11, 5.5.2, Figure 1.
Note: The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

5.7.2.1 Test a): Loss of load			Pass
P_{load} [W]	P_{SUM} before disconnect the load [W]	P_{SUM} after disconnect the load [W]	response time [s]
587	883	883	0,5

5.7.2.1 Test b): Primary energy supply jump				Pass
The primary energy supply is set so that the EZE feeds the power PAV, E = 60% PrE with a tolerance of −2%.		Setting the primary supply allows the EZE to reach nominal power		response time [s]
P_{DC} [W]	P_{SUM} [W]	P_{DC} [W]	P_{SUM} [W]	
993	889	1514	888	0,2

Note:
P_{DC}: setting value of the primary supply power
P_{SUM}: active power at the meter position
P_{load}: setting value of the load power

Diagram: Test a): Loss of load

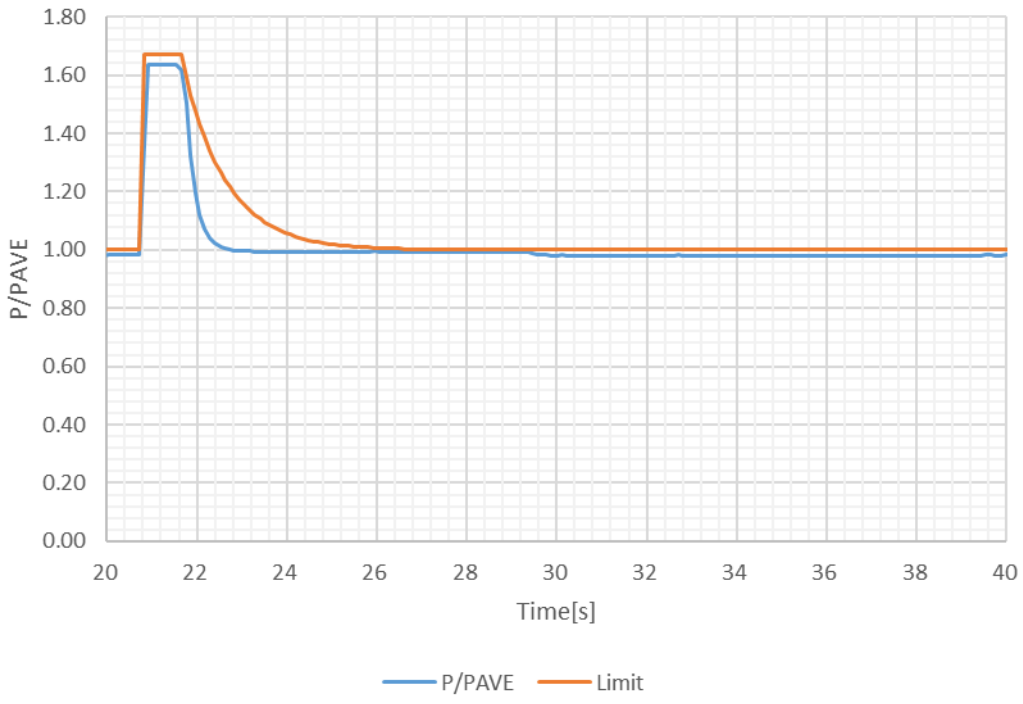
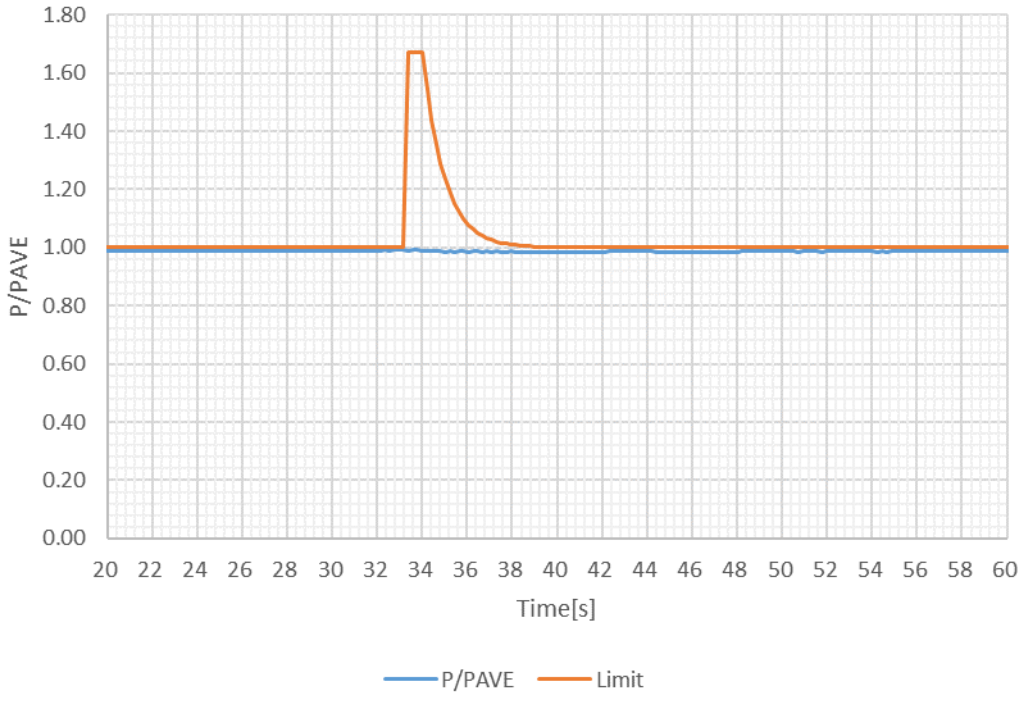
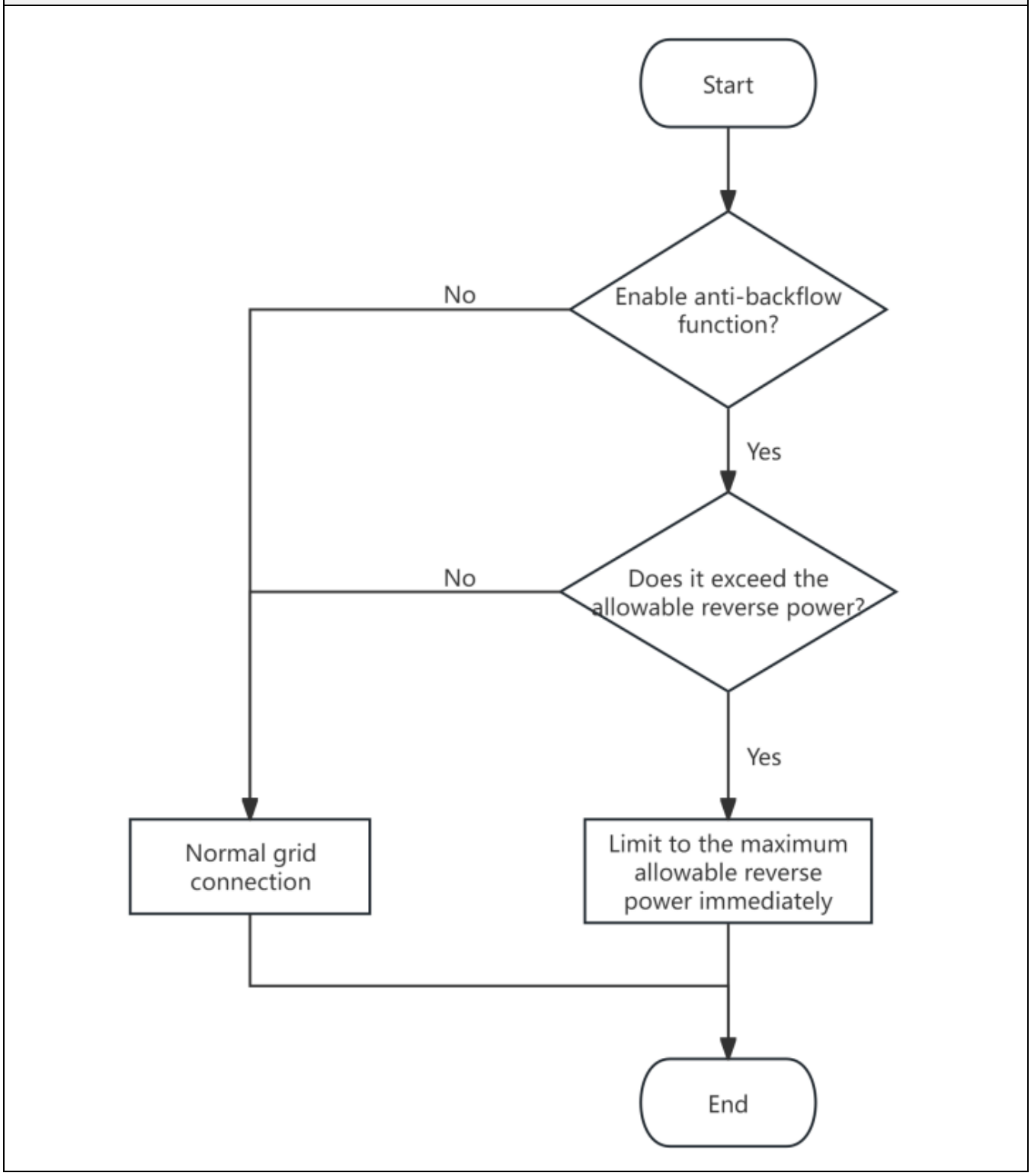


Diagram: Test b): Primary energy supply jump



$P_{AV,E}$ -Control Logic



Datasheet of the Power monitoring unit and Current Transformer:

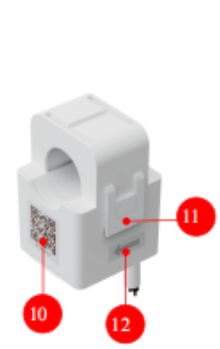
SDM01 1P+N

Smart Energy Monitors with Split-core Current Transformers

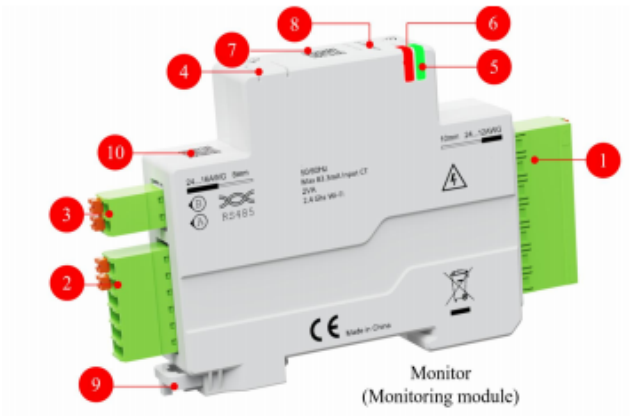
Intelligente Energiemonitore mit geteilten Kernstromtransformatoren (DE) / Monitor di energia Intelligenti con Trasformatori di corrente a nucleo diviso (IT) / Monitores de energía inteligentes con transformadores de corriente de núcleo dividido (ES) / Moniteurs d'énergie intelligents avec transformateurs de courant à noyau fendu (FR) / Monitores de energia inteligentes com transformadores de corrente de núcleo dividido (PT)

Product Description

Produktbeschreibung (DE) / Descrizione del prodotto (IT) / Descripción del producto (ES) / Description du produit (FR) / Descrição do produto (PT)



Split-core CTs
(Detection module)



Monitor
(Monitoring module)

	English (EN)	Deutsch (DE)	Italiano (IT)
1	Connector for voltage take-offs connection	Steckanschluss für die Spannungsabnahme	Connettore per il collegamento dei prelievi di tensione
2	Connector for current transformer connection	Steckverbinder für den Anschluss von Stromwandlern	Connettore per il collegamento del trasformatore di corrente
3	Connector for RS485 communication(optional)	Steckverbinder für RS485-Kommunikation (optional)	Connettore per la comunicazione RS485 (opzionale)
4	Reset button	Reset-Taste	Pulsante di reset
5	Status LED (ACT)	Status-LED (AKT)	LED di stato (ACT)
6	Alarm LED (AL)	Alarm-LED (AL)	LED di allarme (AL)
7	Product QR code	Produkt-QR-Code	Codice QR del prodotto
8	Product model	Produktmodell	Modello del prodotto
9	Locking Clip for DIN rail mounting	Verriegelungsklammer für DIN-Schienenmontage	Clip di bloccaggio per montaggio su rotaia DIN
10	Calibration ID	Kalibrierungs-ID	ID di calibrazione
11	Split-core CT locking clasp	Verriegelungsklammer für geteilte Stromwandlerkerne	Fibbia di bloccaggio per CT a nucleo diviso
12	Positive energy flow direction	Positive Energieflussrichtung	Direzione del flusso energetico

	Español (ES)	Français (FR)	Português (PT)
1	Conector para conexión de tomas de voltaje	Connecteur pour la connexion des prises de tension	Conector para conexão de tomadas de voltagem
2	Conector para conexión de transformador de corriente	Connecteur pour la connexion de transformateur de courant	Conector para conexão de transformador de corrente
3	Conector para comunicación RS485 (opcional)	Connecteur pour la communication RS485 (optionnel)	Conector para comunicação RS485 (opcional)
4	Botón de reinicio	Bouton de réinitialisation	Botão de reset
5	LED de estado (ACT)	LED de statut (ACT)	LED de status (ACT)
6	LED de alarma (AL)	LED d'alarme (AL)	LED de alarme (AL)
7	Código QR del producto	Code QR du produit	Código QR do produto
8	Modelo del producto	Modèle du produit	Modelo do produto
9	Clip de bloqueo para montaje en riel DIN	Clip de verrouillage pour montage sur rail DIN	Clip de travamento para montagem em trilho DIN
10	ID de calibración	ID de calibrage	ID de calibração
11	Broche de bloqueo para CT de núcleo dividido	Fermoir de verrouillage pour transformateur de courant à noyau divisé	Fecho de bloqueio para TC de núcleo dividido
12	Dirección del flujo de energía positiva	Direction du flux d'énergie positive	Direction du flux d'énergie positive

• Comply with the phase and the neutral position. Connect the N pole of the voltage measurement connector to phase voltage is strictly forbidden. • Please ensure that the split-core current transformers not in direct contact with non-insulated conductors. • Disconnect the voltage take-offs of SDM01 before performing the dielectric withstand test or insulation measurements. • Limit the insulation measurements up to 500 VDC. • SDM01 can only be installed upstream if associated with a contactor, frequency converter or motor starters.	• Beachten Sie die Position der Phase und des Neutralleiters. Es ist strengstens verboten, den N-Pol des. Spannungsmessanschlusses mit der Phasenspannung zu verbinden. • Bitte stellen Sie sicher, dass die geteilten Kernstromtransformatoren keinen direkten Kontakt mit nicht isolierten Leitern haben. • Trennen Sie die Spannungsabgriffe des SDM01, bevor Sie die dielektrische Festigkeitsprüfung oder Isolationsmessungen durchführen. • Begrenzen Sie die Isolationsmessungen auf maximal 500 VDC. • SDM01 darf nur stromaufwärts installiert werden, wenn es mit einem Schütz, einem Frequenzumrichter oder einem Motorstarter verbunden ist.	• Rispettare la posizione della fase e del neutro. Collegare il polo N del connettore di misurazione della tensione alla tensione di fase è severamente vietato. • Si prega di assicurarsi che i trasformatori di corrente a nucleo diviso non siano in contatto diretto con conduttori non isolati. • Disconnettere i prelievi di tensione del SDM01 prima di eseguire il test di rigidità dielettrica o le misurazioni dell'isolamento. • Limitare le misurazioni dell'isolamento fino a 500 VDC. • Il SDM01 può essere installato solo a monte se associato a un contattore, un convertitore di frequenza o avviatori di motori.
• Cumplir con la posición de la fase y del neutro. Conectar el polo N del conector de medición de voltaje a la tensión de fase está estrictamente prohibido. • Por favor, asegúrese de que los transformadores de corriente de núcleo dividido no estén en contacto directo con conductores no aislados. • Desconectar las tomas de voltaje del SDM01 antes de realizar la prueba de resistencia dieléctrica o mediciones de aislamiento. • Limitar las mediciones de aislamiento hasta 500 VDC. • El SDM01 solo puede ser instalado aguas arriba si está asociado con un contactor, convertidor de frecuencia o arrancadores de motores.	• Respectez la position de la phase et du neutre. Il est strictement interdit de connecter le pôle N du connecteur de mesure de tension à la tension de phase. • Veuillez vous assurer que les transformateurs de courant à noyau fendu ne sont pas en contact direct avec des conducteurs non isolés. • Déconnectez les prises de tension du SDM01 avant d'effectuer le test de tenue diélectrique ou les mesures d'isolation. • Limitez les mesures d'isolation à 500 VDC. • Le SDM01 ne peut être installé en amont que s'il est associé à un contacteur, un convertisseur de fréquence ou des démarreurs de moteur.	• Cumprir com a posição da fase e do neutro. Conectar o polo N do conector de medição de voltagem à voltagem de fase é estritamente proibido. • Por favor, certifique-se de que os transformadores de corrente de núcleo dividido não estejam em contato direto com condutores não isolados. • Desconectar as tomadas de voltagem do SDM01 antes de realizar o teste de resistência dielétrica ou medições de isolamento. • Limitar as medições de isolamento até 500 VDC. • O SDM01 só pode ser instalado a montante se associado a um contato, conversor de frequência ou partida de motores.

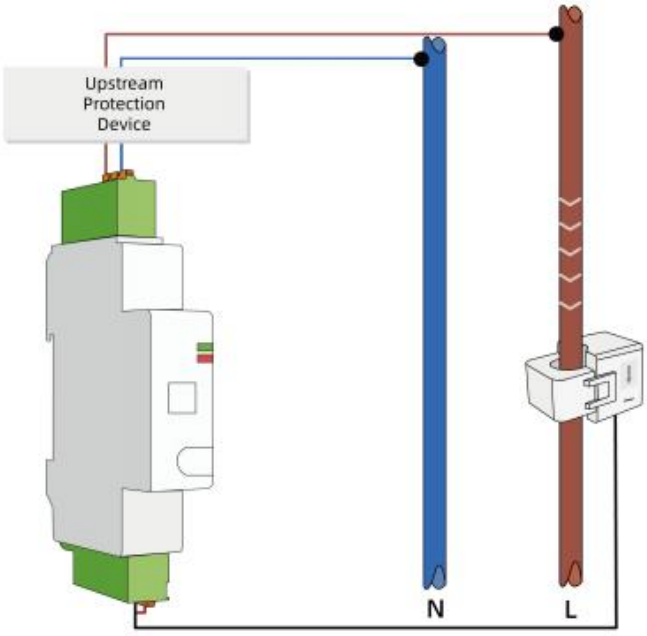
Technical Data

Technische Daten (DE) / Caratteristiche tecniche (IT) / Especificaciones técnicas (ES) / Caractéristiques techniques (FR) / Dados técnicos (PT)

• Rated operating voltage U_n: 220~240 VAC phase to neutral, 50/60 Hz • Max current I_{max}: 80 A / 120 A / 200 A / 250 A • Over-voltage category: III • Rated insulating voltage U_i: 250 V • Rated impulse withstand voltage U_{imp}: 4 kV • Pollution degree: 3 • Protection degree: IP20 • Energy measurement accuracy: 1% • Maximum power consumption: ≤ 2 VA • Rated operating temperature: -25~70 °C	• Nennspannung U_n: 220~240 VAC Phase zu Neutralleiter, 50/60 Hz • Maximaler Strom I_{max}: 80 A / 120 A / 200 A / 250 A • Überspannungskategorie: III • Nennisolationsspannung U_i: 250 V • Bemessungs-Stoßspannung U_{imp}: 4 kV • Verschmutzungsgrad: 3 • Schutzart: IP20 • Genauigkeit der Energiemessung: 1% • Max. Stromaufnahme: ≤ 2 VA • Nennbetriebstemperatur: -25~70 °C	• Tensione nominale U_n: 220~240 VAC Fase al neutro, 50/60 Hz Corrente massima I_{max}: 80 A / 120 A / 200 A / 250 A • Categoria sovratensione: III • Tensione isolante nominale U_i: 250 V • Tensione di tenuta d'impulso nominale U_{imp}: 4 kV • Grado di inquinamento: 3 • Grado di protezione: IP20 • Measurement Accuracy: 1% • Consumo massimo: ≤ 2 VA • Temperatura nominale di esercizio: -25~70 °C
• Voltaje nominal U_n: 220~240 VAC fase al neutro, 50/60 Hz • Corriente máxima I_{max}: 80 A / 120 A / 200 A / 250 A • Categoría de sobretensión: III • Voltaje aislante nominal U_i: 250 V • Voltaje de resistencia a impulsos U_{imp}: 4 kV • Grado de contaminación: 3 • Grado de protección: IP20 • Measurement Accuracy: 1% • Consumo máximo de potencia: ≤ 2 VA • Temperatura de operación nominal: -25~70 °C	• Tension nominale de fonctionnement Un: 220~240 VAC phase au neutre, 50/60 Hz • Courant maximum Imax: 80 A / 120 A / 200 A / 250 A • Catégorie de surtension: III • Tension d' isolement nominale Ui:250 V • Résistance à la tension nominale Uimp: 4 kV • Degré de pollution: 3 • Degré de protection : IP20 • Précision de la mesure de l' énergie: 1% • Consommation maximale : ≤ 2 VA • Température de fonctionnement nominale: -25~70 °C	• Tensão nominal U_n: 220~240 VAC fase al neutro, 50/60 Hz Corrente máxima I_{max}: 80 A / 120 A / 200 A / 250 A • Categoria de sobretensão: III • Tensão de isolamento nominal U_i: 250 V • Tensão de impulso nominal U_{imp}: 4 kV • Grau de poluição: 3 • Grau de proteção: IP20 • Measurement Accuracy: 1% • Consumo máximo de potência: ≤ 2 VA • Temperatura nominal de operação: -25~70 °C

Installation and Connection

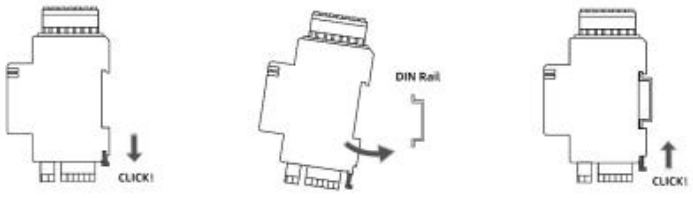
Installation und Anschluss (DE) / Installazione e collegamento (IT) / Instalación y conexión (ES) / Installation et raccordement (FR) / Instalação e ligação (PT)



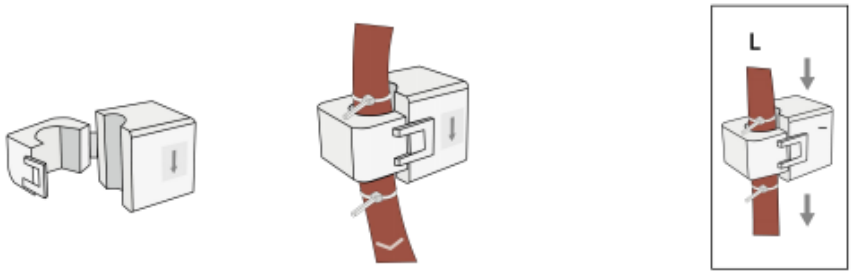
NOTICE / HINWEIS / AVVISO / AVISO / AV

• Voltage measurement must match current measurement – L (I) , to measure electrical data correctly. • It can cause product damage, if the blue cable for N connection is connected to phase conductors by mistake.	• Die Spannungsmessung muss mit der Strommessung übereinstimmen – L (I), um elektrische Daten korrekt zu messen. • Es kann zu Produktschäden führen, wenn das blaue Kabel für den N-Anschluss versehentlich mit den Phasenleitern verbunden wird.	• La misurazione della tensione deve corrispondere alla misurazione della corrente - L (I); Vz (Iz), per misurare correttamente i dati elettrici. • Collegare per errore il cavo blu della connessione N ai conduttori di fase può provocare danni al prodotto.
• La medición de voltaje debe coincidir con la medición de corriente – L (I), para medir correctamente los datos eléctricos. • El producto podría dañarse si el cable azul de conexión N se conecta por error a los conductores de fase.	• La mesure de tension doit correspondre à la mesure de courant – L (I), pour mesurer correctement les données électriques. • Peut endommager le produit si le câble bleu du branchement N est connecté aux conducteurs de phase par erreur.	• A medição de tensão deve corresponder à medição de corrente – L (I), para medir corretamente os dados elétricos. • O produto poderá sofrer danos caso o cabo azul para conexão N seja conectado aos condutores de fase por engano.

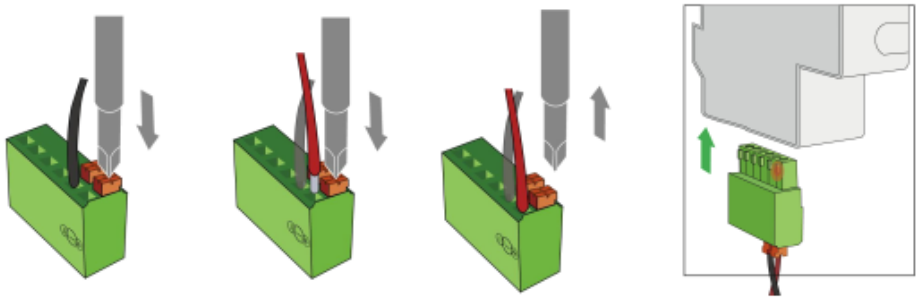
1 Install the Monitor / Installieren Sie den Monitor / Installa il monitor / Instala el monitor / Installez le moniteur / Instale o monitor



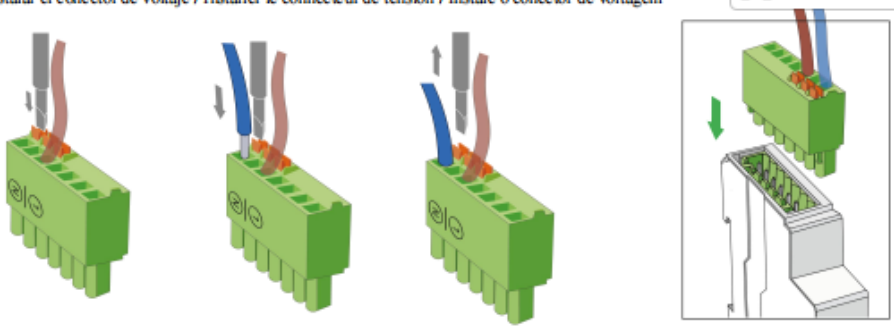
2 Install the Current Transformer/ Installieren Sie den Stromwandler / Installare il trasformatore di corrente / Instalar el transformador de corriente / Installer le transformateur de courant / Instale o transformador de corrente



3 Install the Current Transformer connector/ Installieren Sie den Stromwandleranschluss / Installare il connettore del trasformatore di corrente /Instalar el conector del transformador de corriente / Instalar el conector del transformador de corriente / Instale o conector do transformador de corrente



4 Install the voltage conncetor/ Installieren Sie den Spannungsstecker / Installare il connettore di tensione / Instalar el conector de voltaje / Installer le connecteur de tension / Instale o conector de voltagem

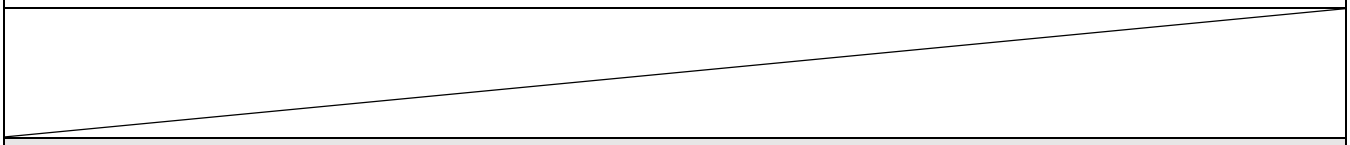


NOTICE / HINWEIS / AVVISO / AVISO / AVIS / AVISO

• To guarantee measurement accuracy it is recommended to keep the conductor adherent to the CT body by two fixing straps, see figure.	• Um die Messgenauigkeit zu gewährleisten, wird empfohlen, den Leiter mit zwei Befestigungsbändern am CT-Körper zu fixieren, siehe Abbildung.	• Per garantire l'accuratezza delle misurazioni, si raccomanda di mantenere il conduttore aderente al corpo del CT con due cinghie di fissaggio, vedere figura.
• Para garantizar la precisión de la medición, se recomienda mantener el conductor adherido al cuerpo del CT con dos correas de fijación, vea la figura.	• Pour garantir la précision des mesures, il est recommandé de maintenir le conducteur adhérent au corps du CT à l'aide de deux sangles de fixation, voir la figure.	• Para garantir a precisão da medição, é recomendado manter o condutor aderente ao corpo do CT com duas correias de fixação, veja a figura.

5.7.2.2 Test disconnection function			N/A
Test:	**P_{SUM} before energy jump [W]**	**Required energy jump [W]**	**Disconnection time [s]**
a)	--	--	--
b)	--	--	--
c)	--	--	--
d)	--	--	--

Diagram:



Assessment criterion:

The test according to 5.7.2.2 shall be deemed to have been passed if, in the case of a), there were no shutdowns and, in the case of b), c) and d), a shutdown after the time t defined in Table 16.

Table 16

Test	Rated Power	Limit Disconnect time t
a)	$0,98*P_{AV,E}$	No disconnection
b)	$1,02*P_{AV,E} – 1,067*P_{AV,E}$	t < 10s + 0,2s
c)	$1,067*P_{AV,E} – 1,670*P_{AV,E}$	t < 3s + 0,2s
d)	$1,690*P_{AV,E}$	t < 0,2s

Note:

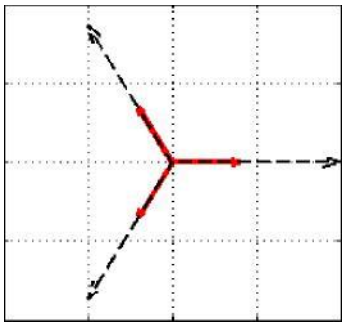
The EUT evaluated and tested the examination of regular dynamics used the P calculation check with a real EZE according to requirement of VDE-AR-N 4105, 5.5.2.

The nominal output power of EZE declared by manufacture.

5.8 Evidence dynamic grid support			
5.8.1	General		**P**
5.8.3	Testing of the dynamic grid support PGU Type 1		**N/A**
5.8.3	Testing of the dynamic grid support PGU Type 2		**P**

5.8.1 General	P

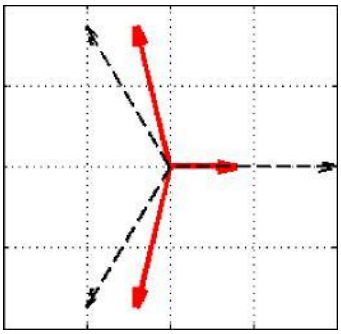
FRT test for three-phase symmetrical (Test ref no. x.1.x)



Typ-A

LVRT test for two-phase asymmetrical fault (Test ref no. 1.3.x to 4.3.x)

Test No.	V/V_{nom}	Phase-to-earth voltages			Phase angles		
		$u_1/u_{1,nom}$	$u_2/u_{2,nom}$	$u_3/u_{3,nom}$	φ_{u1}	φ_{u2}	φ_{u3}
1.3, 1.4, 1.5	0,15 ± 0,05	0,62 ± 0,05	0,15 ± 0,05	0,62 ± 0,05	-143°	120°	23°
2.3, 2.4, 3.3, 3.4	0,50 ± 0,05	0,76 ± 0,05	0,50 ± 0,05	0,76 ± 0,05	-131°	120°	11°
4.3, 4.4	0,50 ± 0,05	0,93 ± 0,05	0,85 ± 0,05	0,93 ± 0,05	-123°	120°	3°
Normal condition	1	1	1	1	-120°	120°	0°



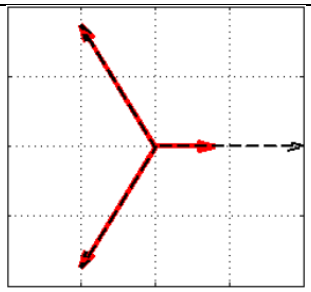
Typ-D

FRT test for two-phase asymmetrical fault (Test ref no. 5.3.x to 7.3.x)

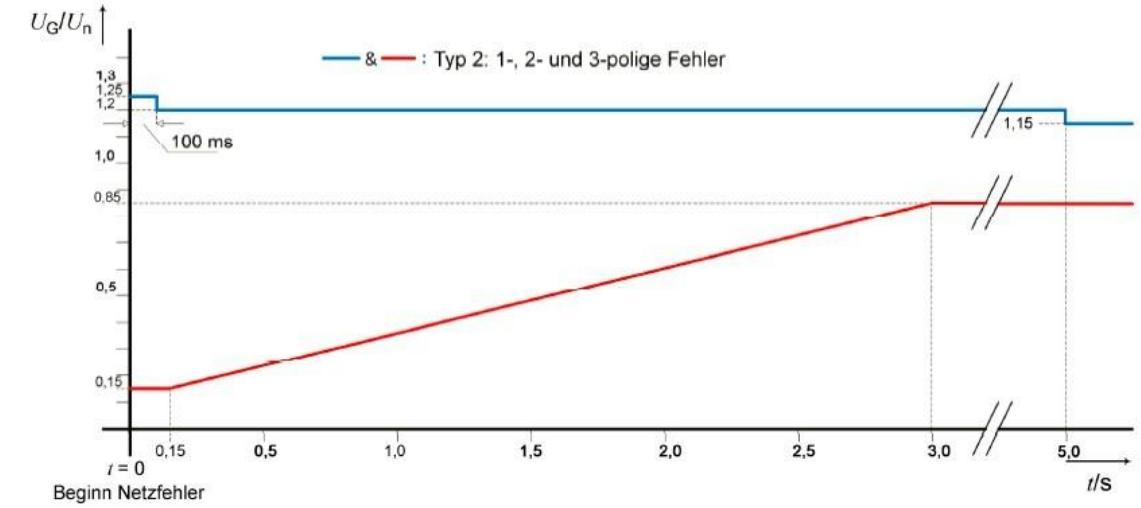
Test No.	V/V_{nom}	Phase-to-earth voltages			Phase angles		
		$u_1/u_{1,nom}$	$u_2/u_{2,nom}$	$u_3/u_{3,nom}$	φ_{u1}	φ_{u2}	φ_{u3}
5.3, 5.4	1,25 ± 0,05	1,08 ± 0,05	1,25 ± 0,05	1,06 ± 0,05	-115°	-120°	6°
6.3,6.4	1,20 ± 0,05	1,06 ± 0,05	1,20 ± 0,05	1,05 ± 0,05	-116°	-120°	5°
7.3,7,4	1,15 ± 0,05	1,04 ± 0,05	1,15 ± 0,05	1,04 ± 0,05	-117°	-120°	4°
Normal condition	1	1	1	1	-120°	120°	0°

FRT test for two-phase asymmetrical fault (Test ref no. x.3.x)

5.8.1 General	P



Typ-B



Legende

& FRT-Kurve für 1-, 2- und 3-polige Netzfehler

UG Effektivwert der aktuellen Spannung an den Generatorklemmen

Bild 12 – Fault-Ride-Through-Grenzkurve für den Spannungsverlauf an den Generatorklemmen für eine Erzeugungseinheit vom Typ 2 und für Speicher

Figure 12 - Fault ride-through limit curve for the voltage curve at the generator terminals for a **type 2** generation unit and for storage

5.8.3	Testing of the dynamic grid support	P
For PGUs Type 2 and storage systems		P
1-phase systems		
CME06-2BM250		

Test	Voltage dip to [p.u.]	Dip type	duration [s]	P set point [p.u.]	Q set point [p.u.]	Comment	Recovery response time [s]		Test ref. No.*
							P	Q	
1	0,15 to 0,25	A	for 0,15 ≥0,150 / for 0,25 ≥0,500	1	0 to ± 0,1	Symmetric	0,761	--	1.1
				0,2 to 0,6			0,593	--	1.2
		D1[1)]		1		Asymmetric (ph-ph + Dy5-transformer)	0,693	--	1.3
				0,2 to 0,6			0,568	--	1.4
		D2[2)]		1			0,743	--	1.5
2	0,50 to 0,60	A	for 0,50 ≥1,5 / for 0,60 ≥2,000	1	Max. over excited**	Symmetric	0,787	9,555	2.1
				0,2 to 0,6			0,818	9,725	2.2
		D1[1)]		1		Asymmetric (ph-ph + Dy5-transformer)	0,664	9,786	2.3
				0,2 to 0,6			0,750	9,514	2.4
3	0,50 to 0,60	A	for 0,50 ≥1,500 / for 0,60 ≥2,000	1	Max. under excited**	Symmetric	0,738	9,589	3.1
				0,2 to 0,6			0,600	9,297	3.2
		D1[1)]		1		Asymmetric (ph-ph + Dy5-transformer)	0,738	9,807	3.3
				0,2 to 0,6			0,709	9,764	3.4
4	0,85 to 0,90	A	≥60,000	1	0 to ± 0,1	Symmetric	0,623	--	4.1
				0,2 to 0,6			0,690	--	4.2
		D1[1)]		1		Asymmetric (ph-ph + Dy5-transformer)	0,236	--	4.3
				0,2 to 0,6			0,190	--	4.4
5	1,20 to 1,25	A	≥0,100	1	0 to ± 0,1	Symmetric	0,580	--	5.1
				0,2 to 0,6			0,746	--	5.2
		D1[1)]		1		Asymmetric (ph-ph + Dy5-transformer)	0,181	--	5.3
				0,2 to 0,6			0,186	--	5.4
		D2[2)]		1			0,688	--	5.5
6	1,15 to 1,20	A	≥5,000	1	0 to ± 0,1	Symmetric	0,658	--	6.1
				0,2 to 0,6			0,735	--	6.2
		D1[1)]		1		Asymmetric (ph-ph + Dy5-transformer)	0,136	--	6.3
				0,2 to 0,6			0,249	--	6.4
7	1,10 to 1,15	A	≥60,000	1	0 to ± 0,1	Symmetric	0,708	--	7.1
				0,2 to 0,6			0,648	--	7.2
		D1[1)]		1		Asymmetric (ph-ph + Dy5-transformer)	0,405	--	7.3
				0,2 to 0,6			0,143	--	7.4

5.8.3	Testing of the dynamic grid support	P

Note:

At lease the recording must begin at least 10s before the error occurs. After a faulty declaration (Voltage in the range 0,85 U_n ≤U ≤ 1,1U_n), the recording must continue for at least another 60s.

Behaviour during the network error:

No disconnection of the PGU during the voltage drops the grid. If the PGU disconnects from the grid, the time of disconnection must be documented.

- Type 2 units and storage systems are not allowed to inject either active or reactive current during a line voltage at the PGUs terminals below 0,8 Un and above 1,15 Un. This requirement is met if, in the event of an under-/ under voltage dip, the injected current of the generating unit and / or the storage systems does not exceed 20% of the rated current Ir and no more than 10% Ir after 0,06s after the occurrence of this under-/ under voltage dip in any phase.

Behaviour after the end of the error:

- Not disconnection of the PGU within 60s after the end of the fault.
- Type 2 units and storage systems: Reaction time of active power up to 1s, Reaction time of reactive power according to PT1 behaviour with 3τ = 10s in accordance with VDE-AR-N 4105: 2018-11, 5.7.2.5

Table above shows test sequences for single-phase unit.

- [1)] One-phase EZE are connected to the phase W and N for error pattern D1
- [2)] One-phase EZE are connected to the phase V and N for error pattern D2

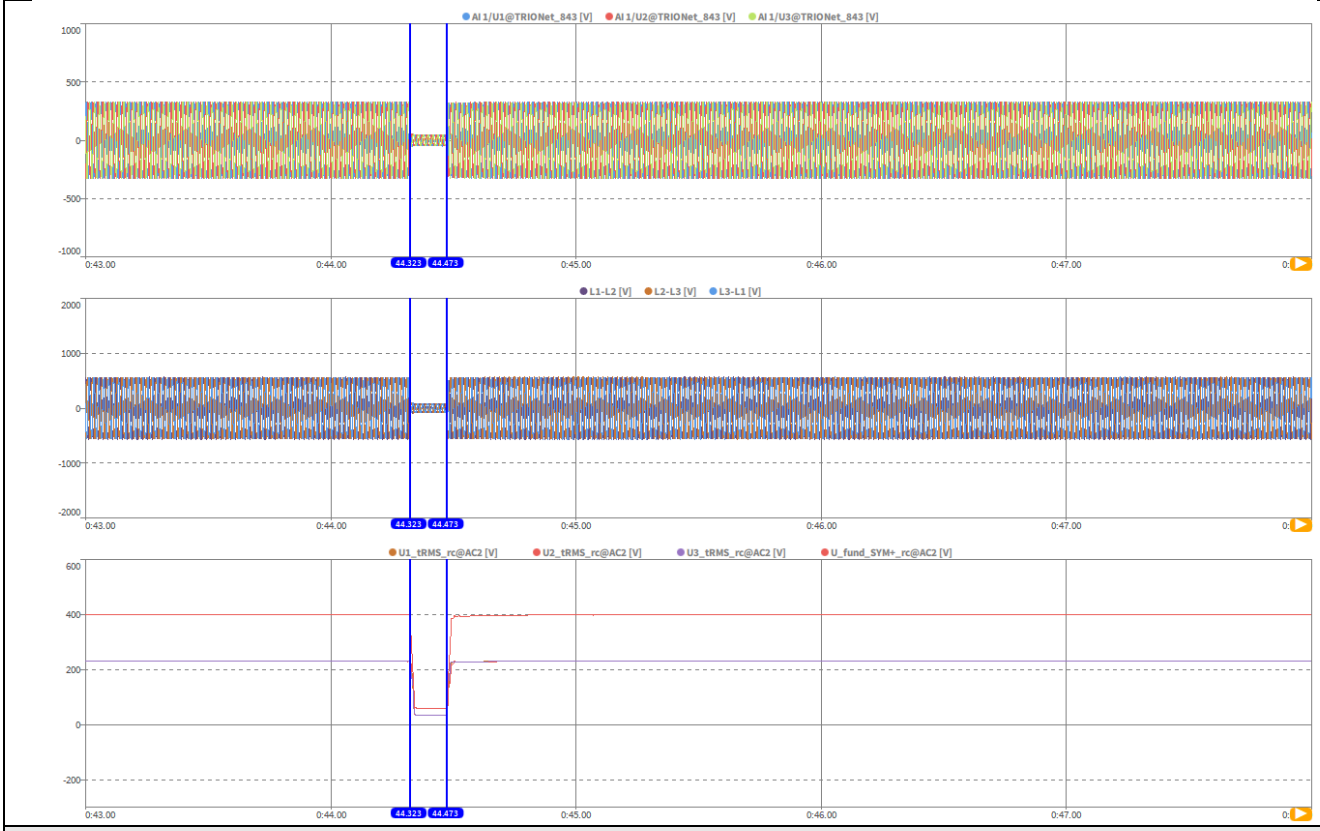
"*" The test has been performed twice and only show one times tested result in the test report.

The test results of the **CME06-2BM250** can be applied to other units in the product series directly, since it is identical in hardware and just power derated by software.

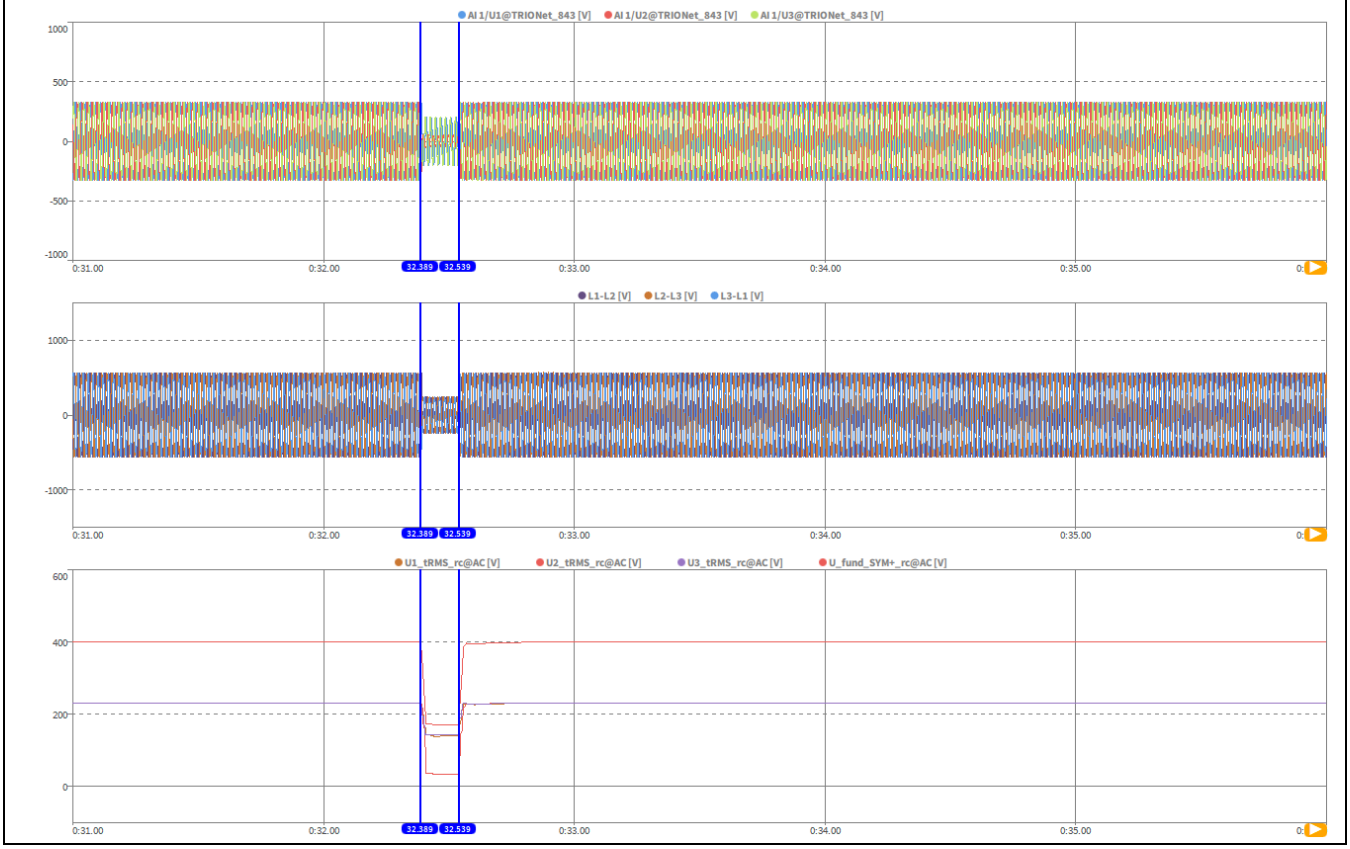
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

1.1



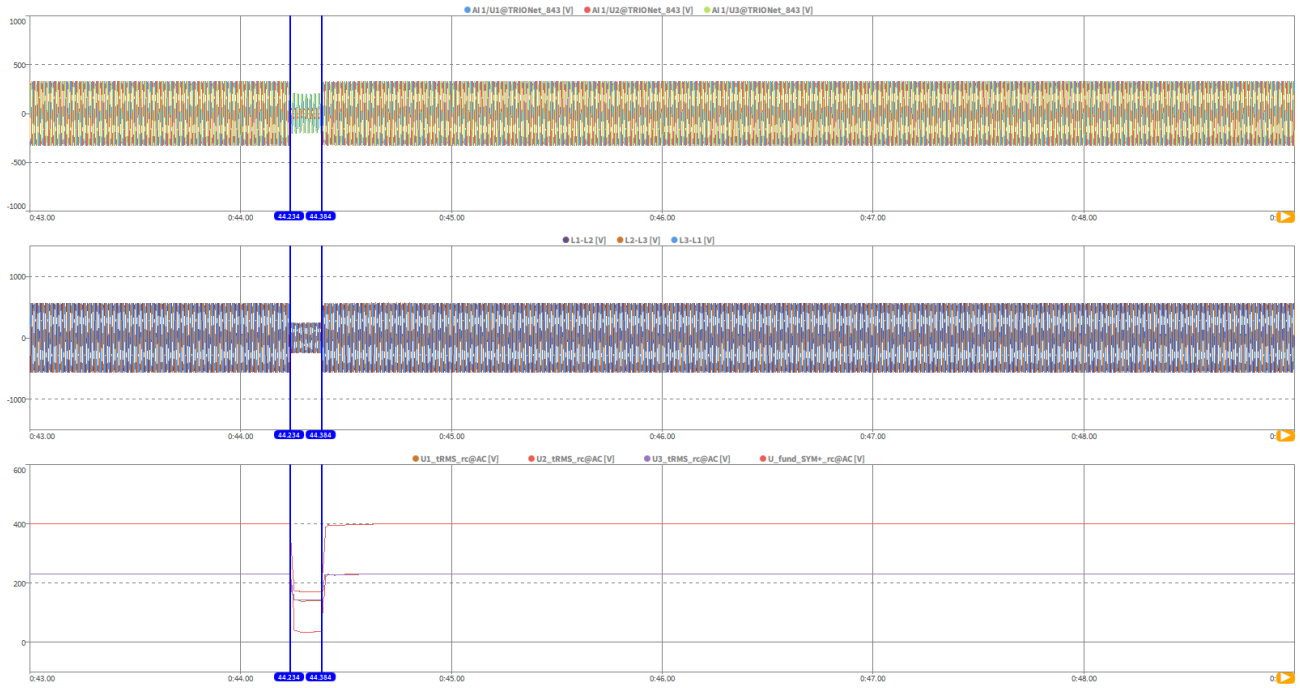
1.3



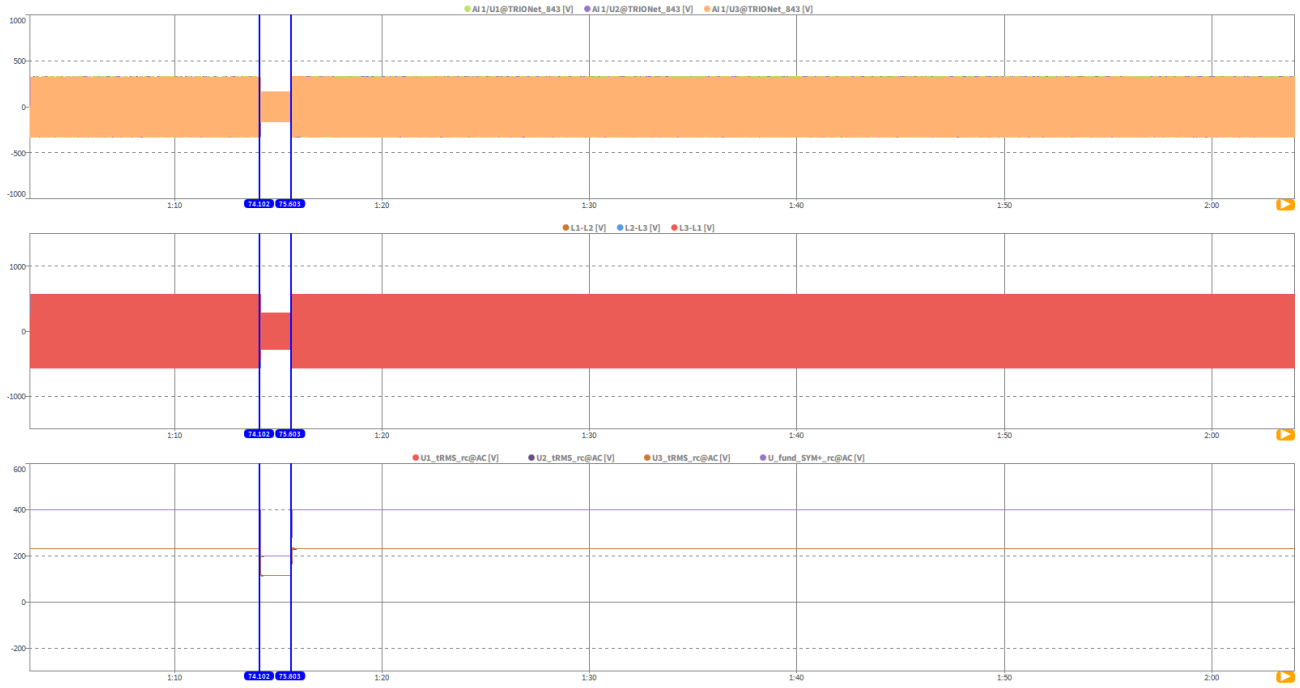
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

1.5



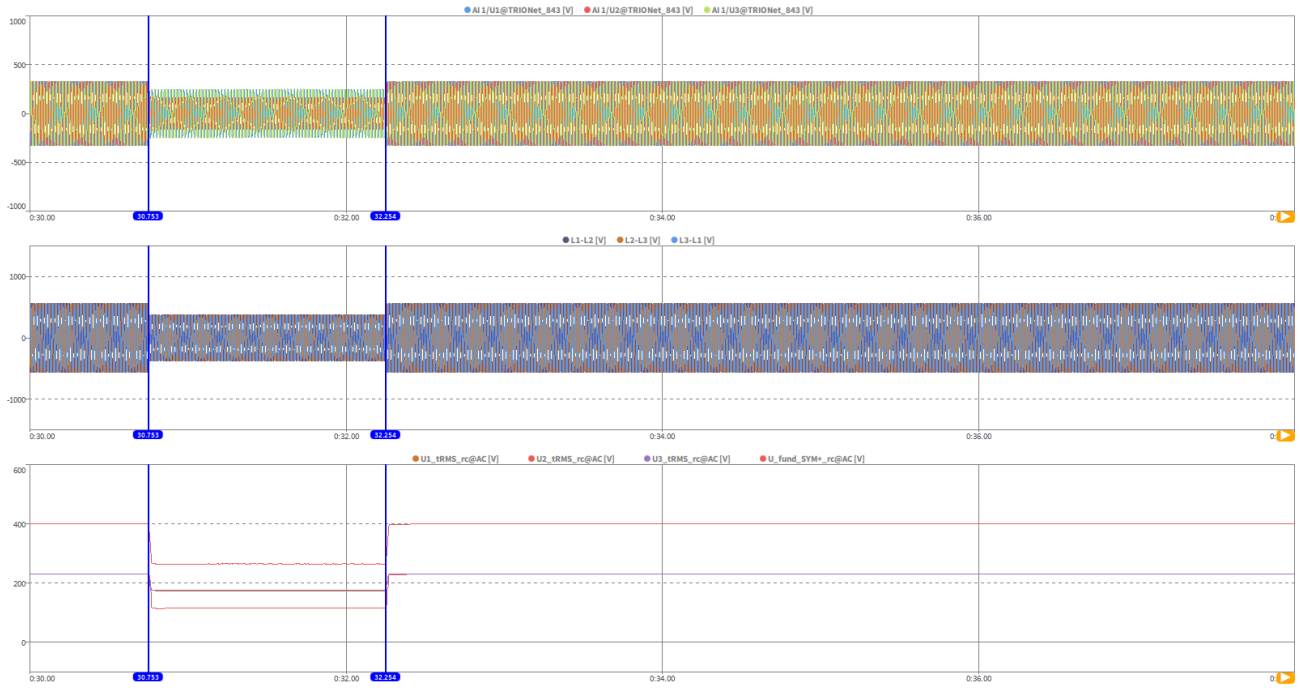
2.1



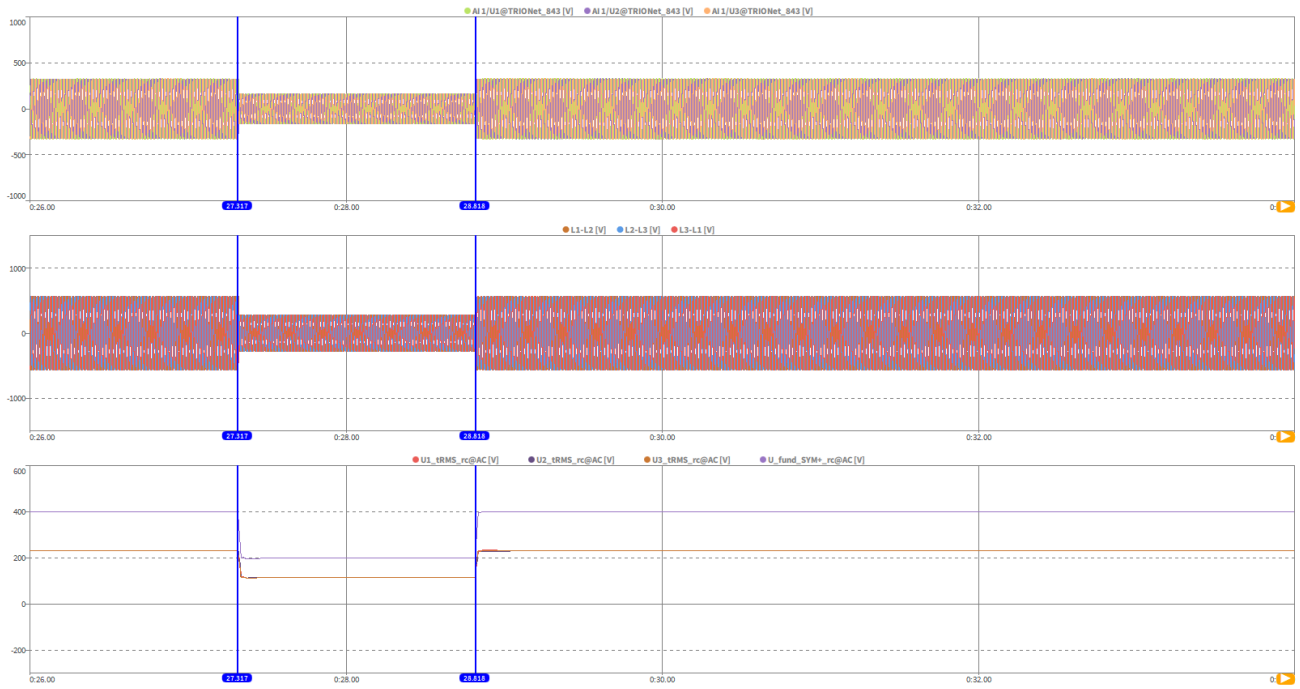
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

2.3



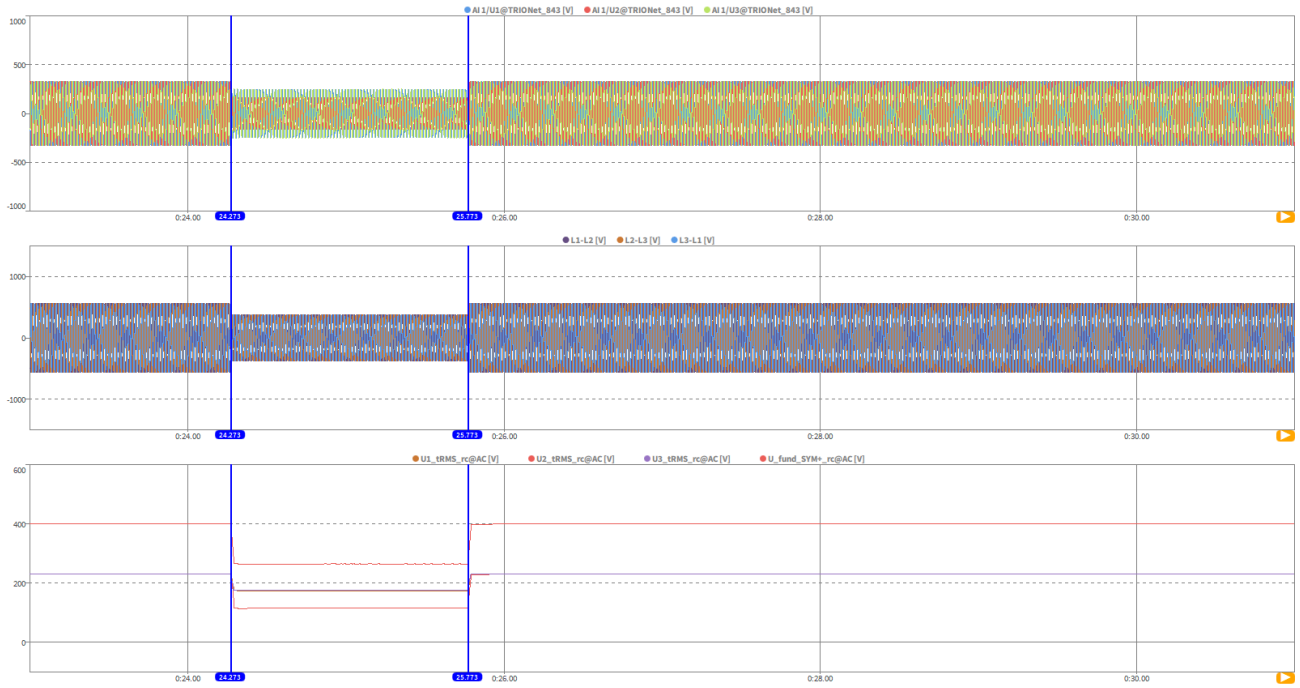
3.1



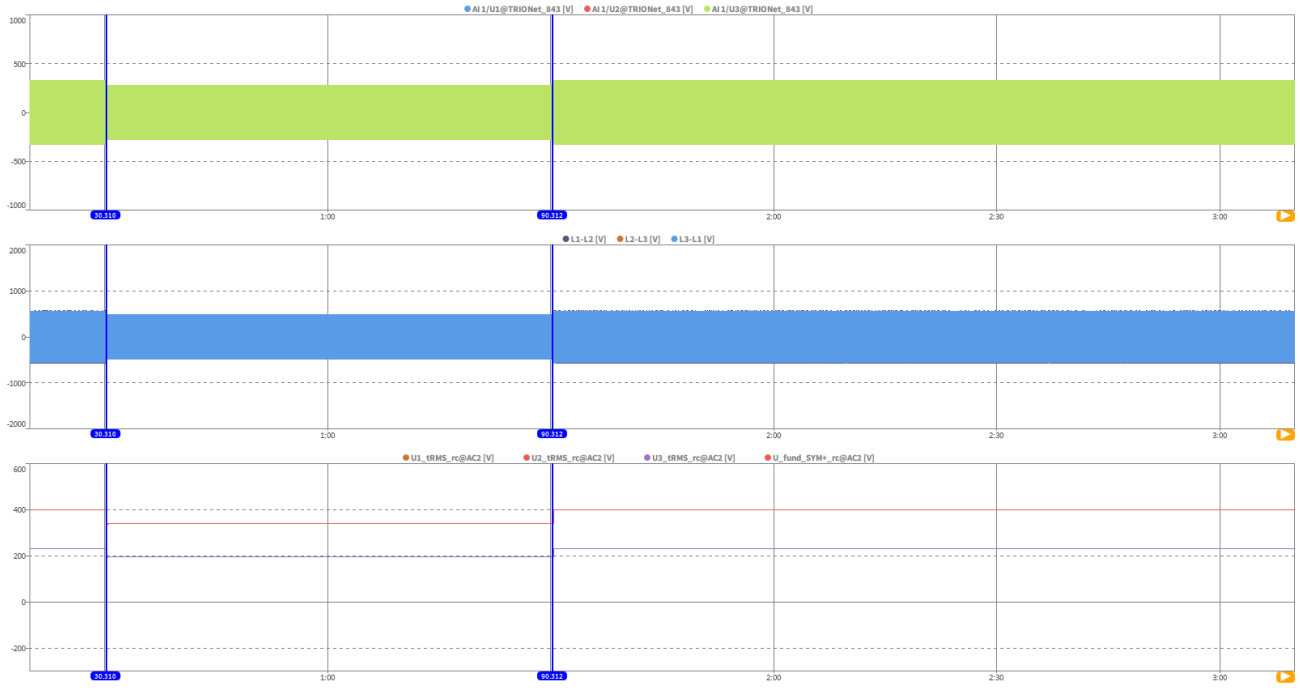
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

3.3



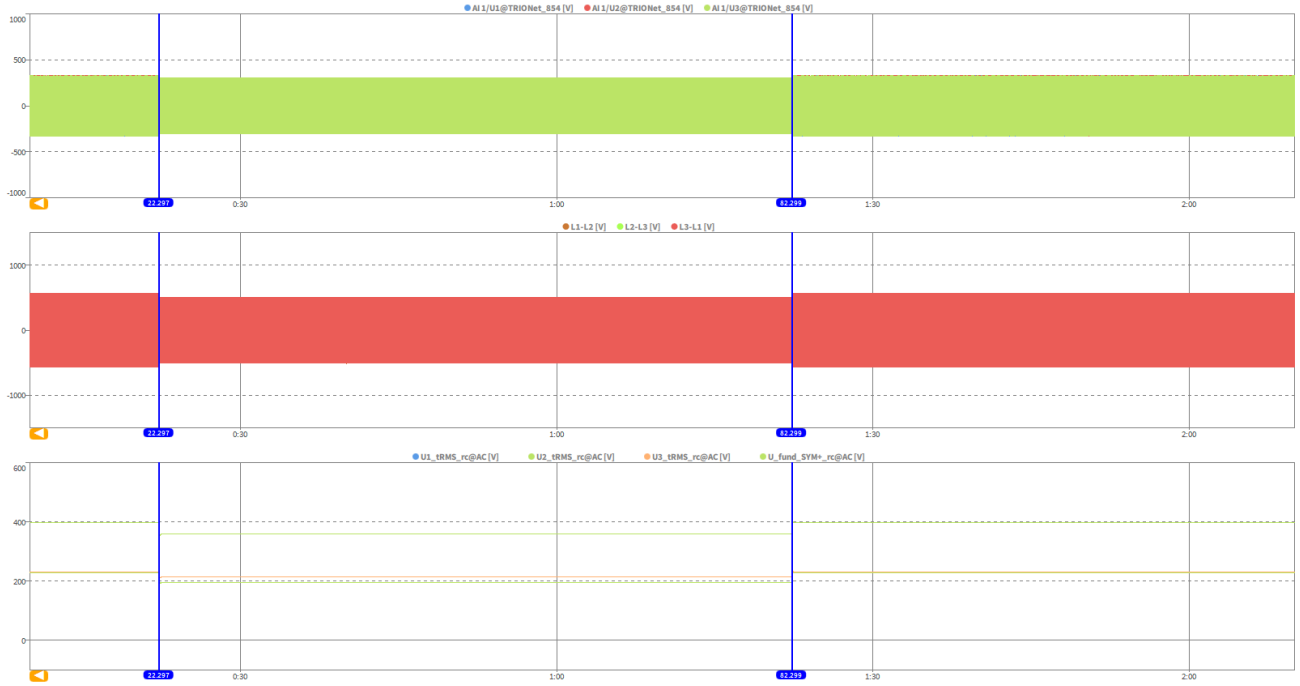
4.1



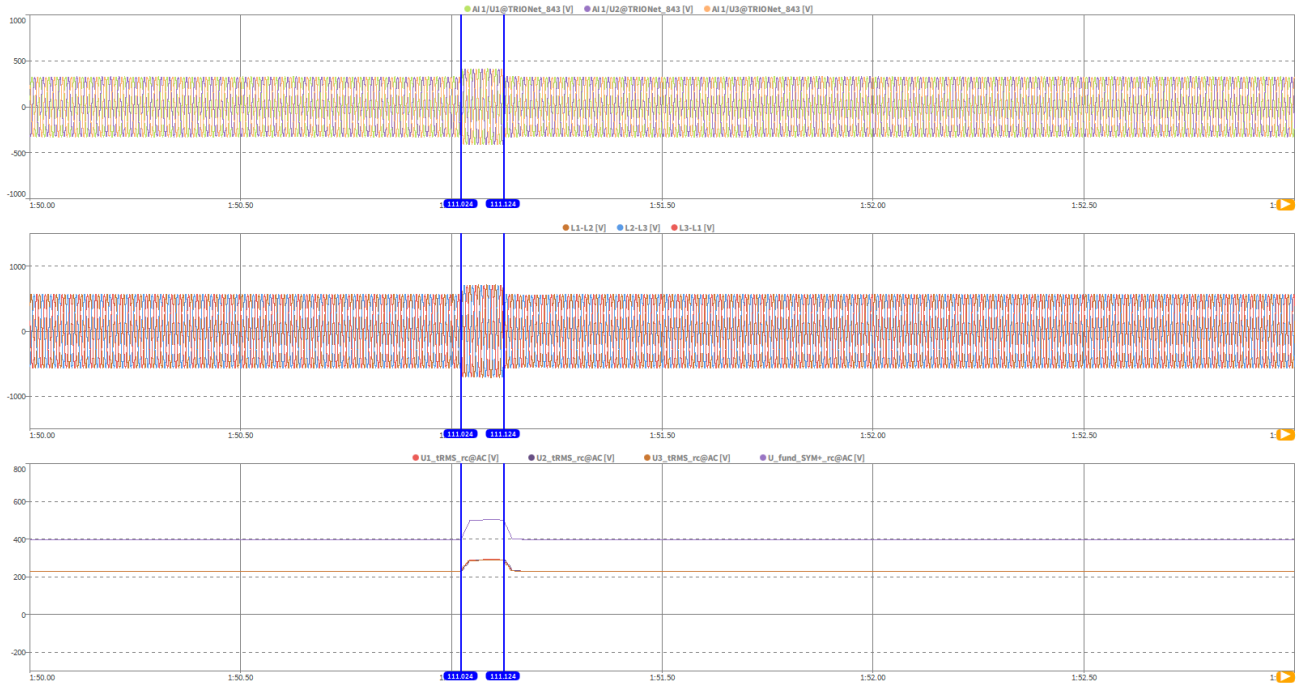
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

4.3



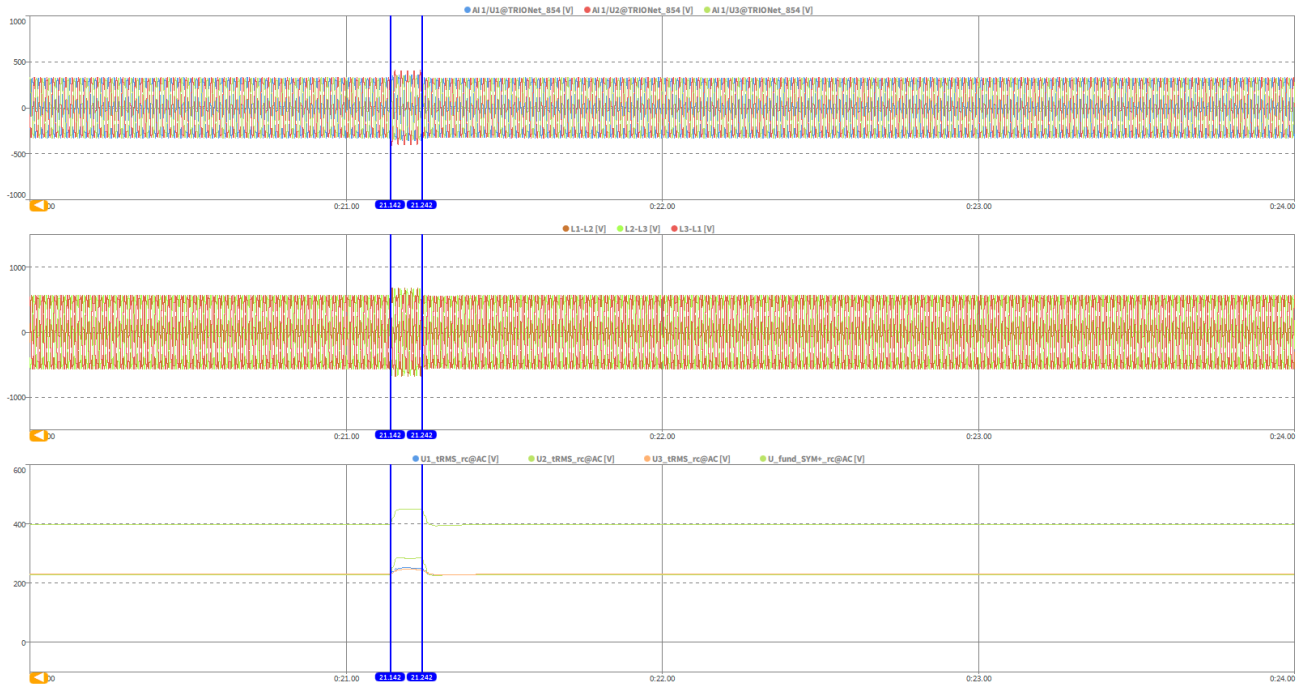
5.1



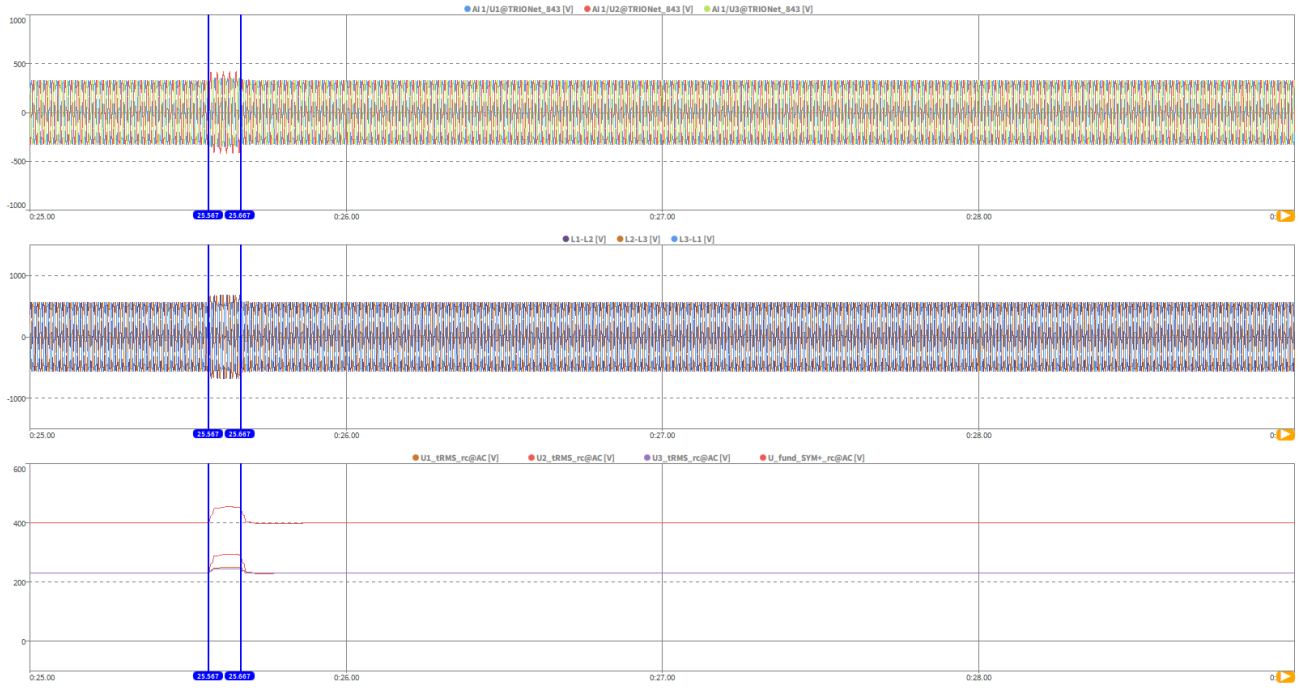
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

5.3



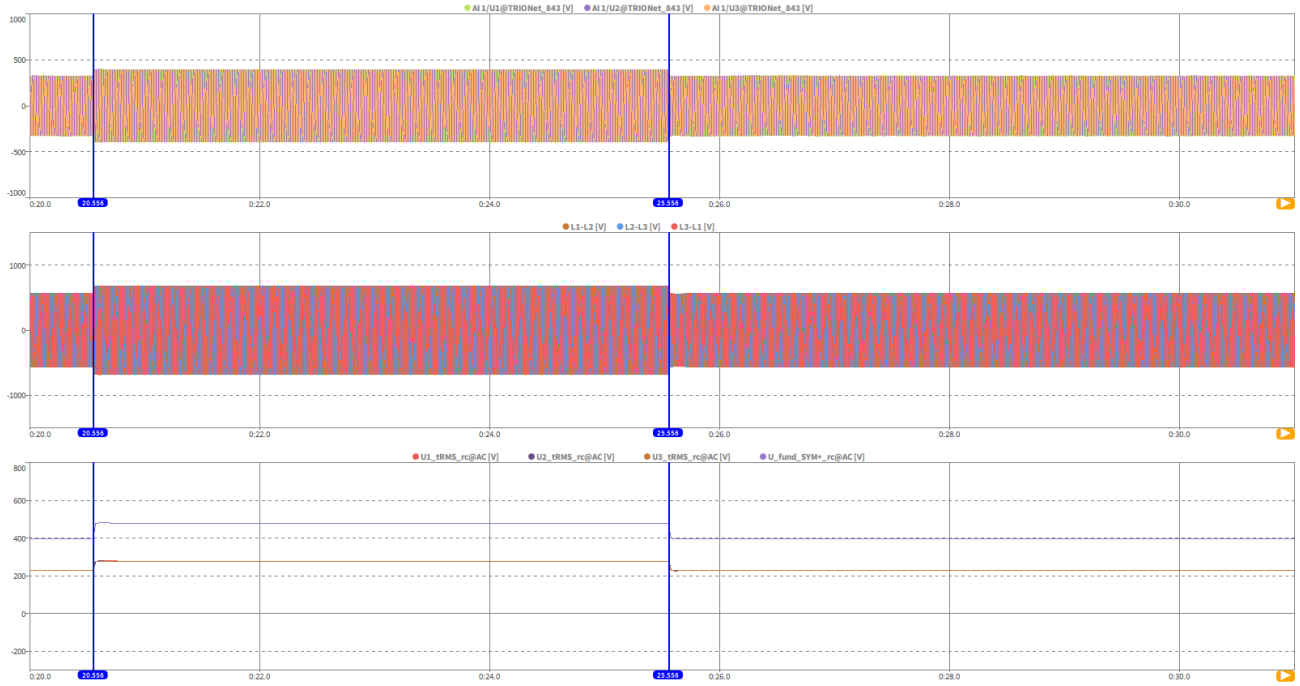
5.5



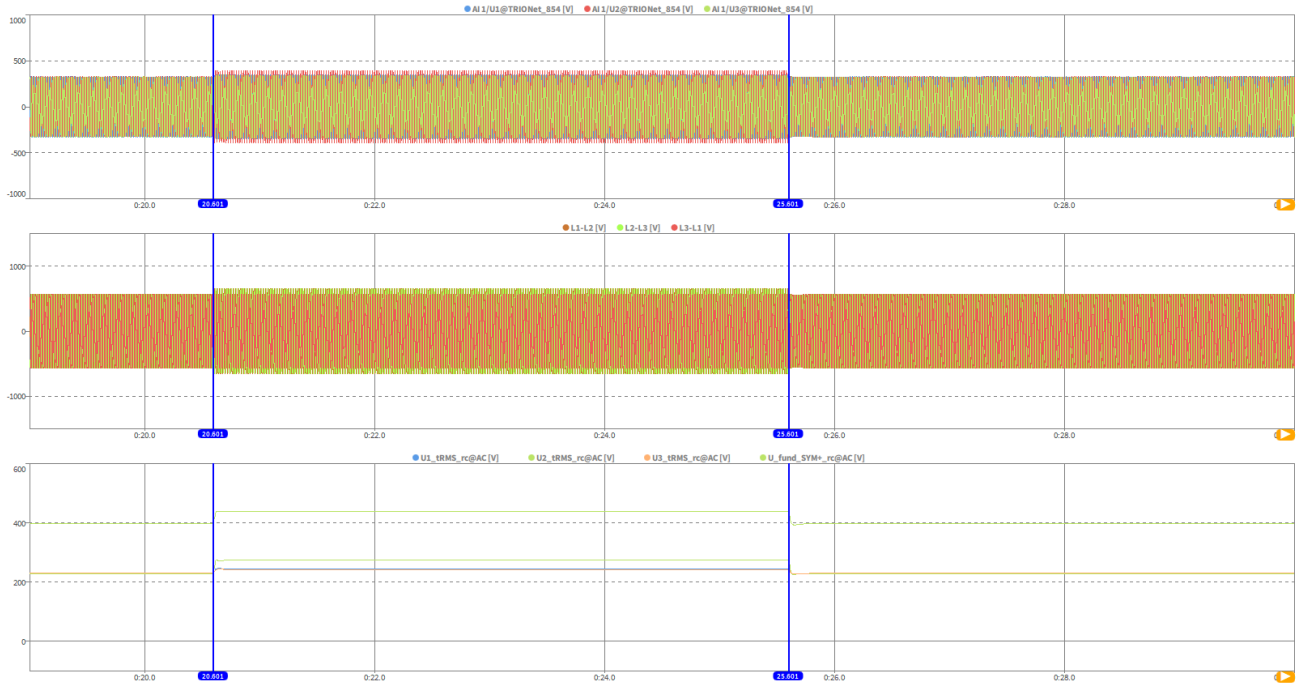
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

6.1



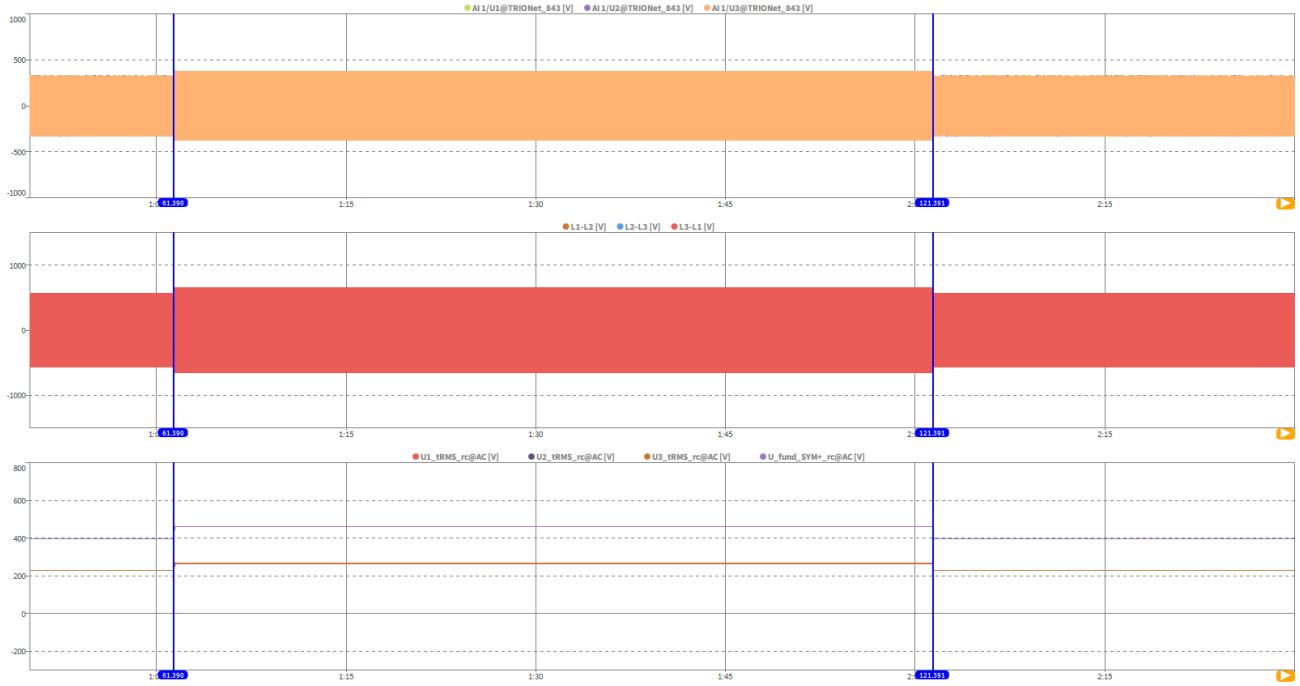
6.3



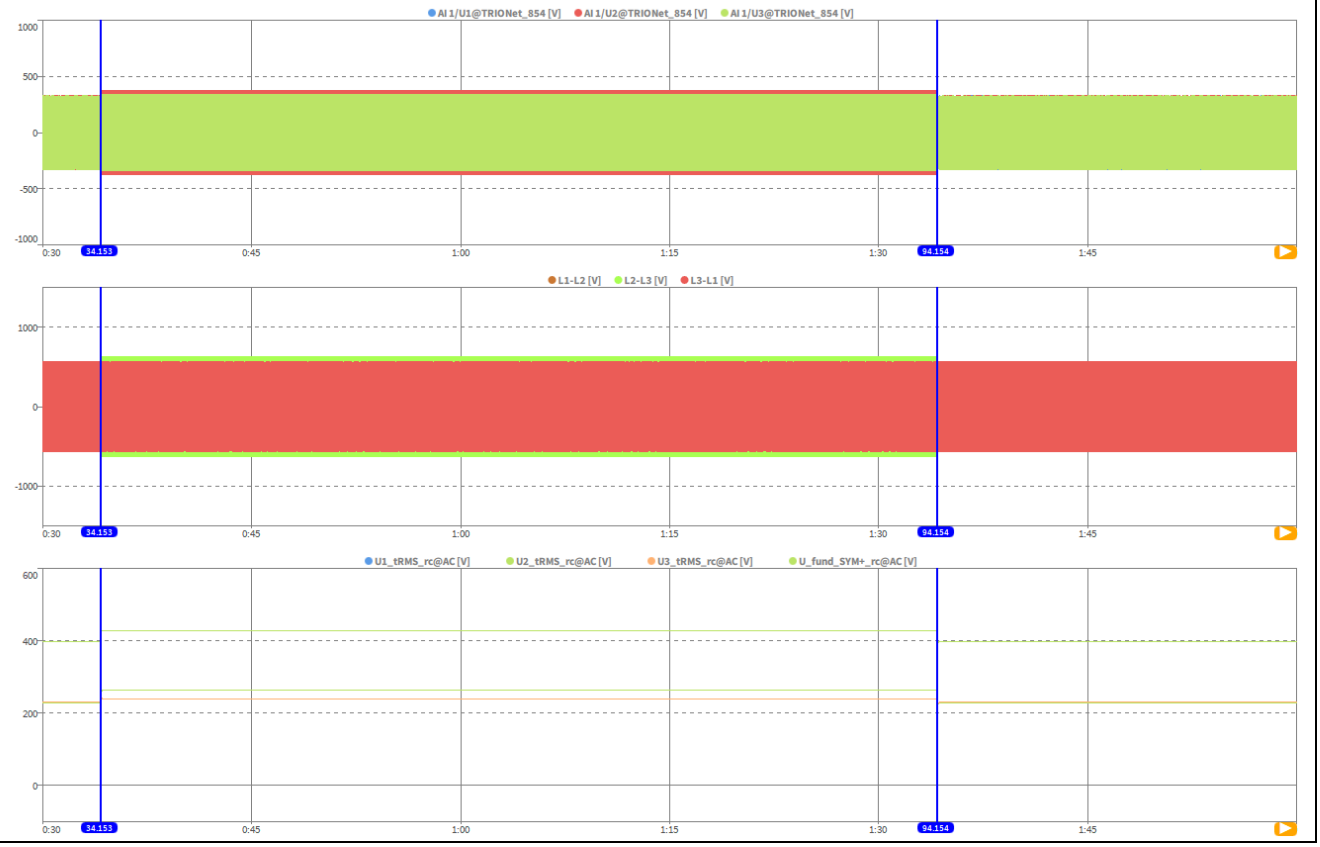
5.8.3	For PGUs Type 2 and storage systems – no load	P

CME06-2BM250

7.1



7.3



5.8.3	For PGUs Type 2 and storage systems	P

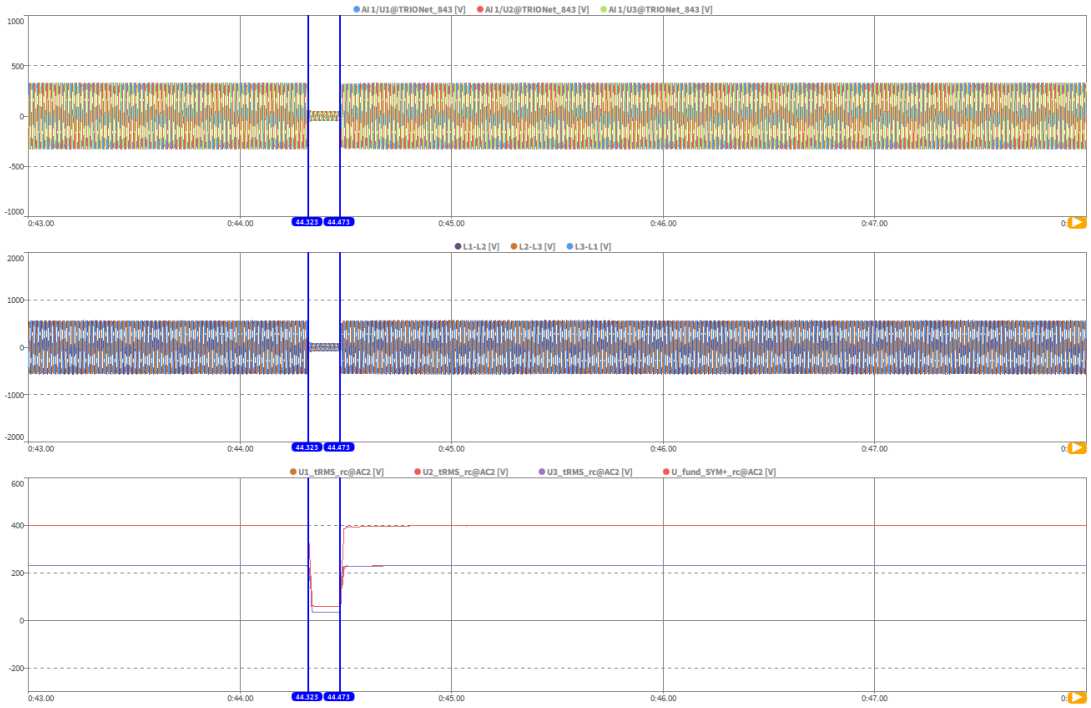
CME06-2BM250

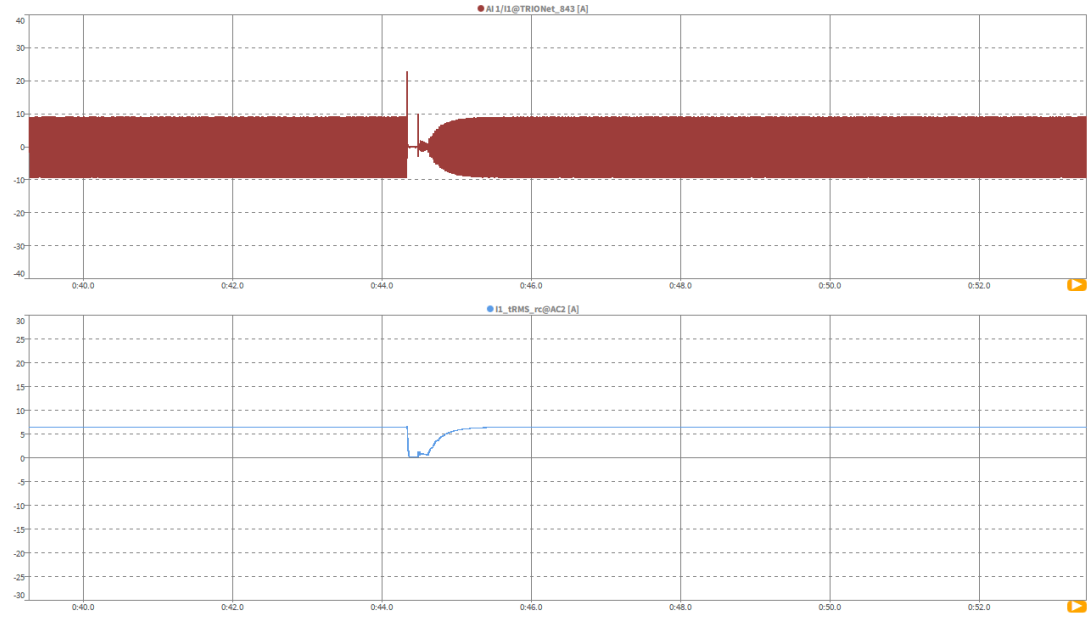
1.1

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1,1
	1	Date	--	--	yyyy.mm.dd	2026/2/9
	2	Time (start of test)	--	--	hh:mm:ss.f	13:31:10
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,15
	5	Setting dip duration		--	--	150
	6	Point of fault entry	Total	--	ms	44323
	7	Point of fault clearance	Total	--	ms	44473
	8	Fault duration in empty load test	Total	--	ms	150
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,149
	10		Total (Phase 2)			0,149
	11		Total (Phase 3)			0,149
	12		Positive sequence			0,149
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,002
	14		Phase 2			0,997
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,990
	17	Active power	Total	t1-10s to t1	p.u.	0,992
	18		Pos.			0,992
	19	Reactive power	Total	t1-10s to t1	p.u.	0,022
	20		Pos.			0,005
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,149
	23		Phase 2			0,149
	24		Phase 3			0,149
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,015
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,019
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,000
	32		Pos.			0,000
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,002
	34		Phase 2			0,997
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,992
	37		Pos.			0,992
	38	Active power rising time	Total	--	s	0,761
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,021
	40		Pos.			0,004
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

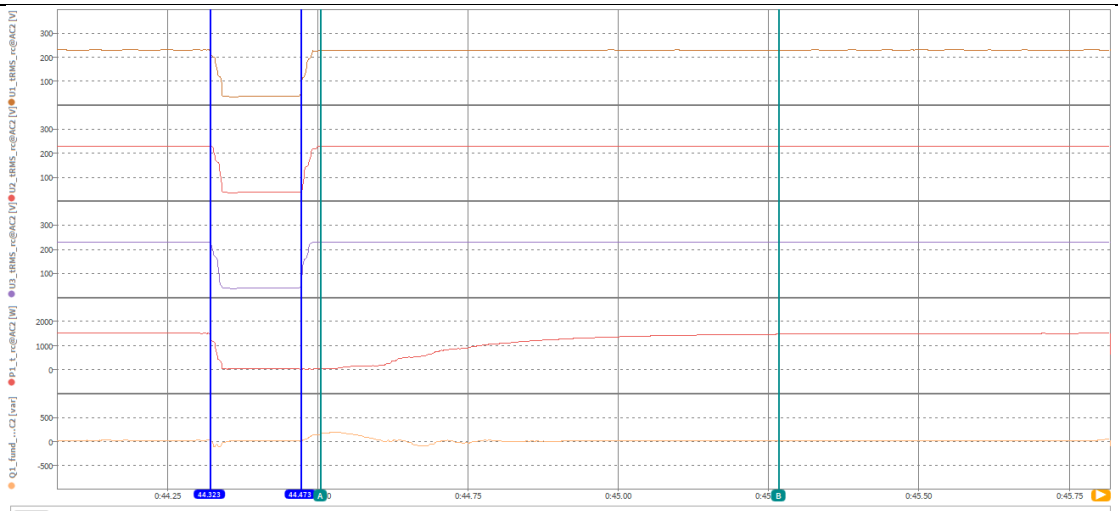
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:44.506034	0:45.267377	0.761344
U1_tRMS_rc@AC2 [V]	227.0331	230.3149	3.281769
U2_tRMS_rc@AC2 [V]	229.5822	229.4424	-0.139786
U3_tRMS_rc@AC2 [V]	227.8938	229.6002	1.706436
P1_t_rc@AC2 [W]	0.168662	1449.145	1448.977
Q1_fund_rc@AC2 [var]	133.4093	4.957042	-128.4522

5.8.3	For PGUs Type 2 and storage systems	P

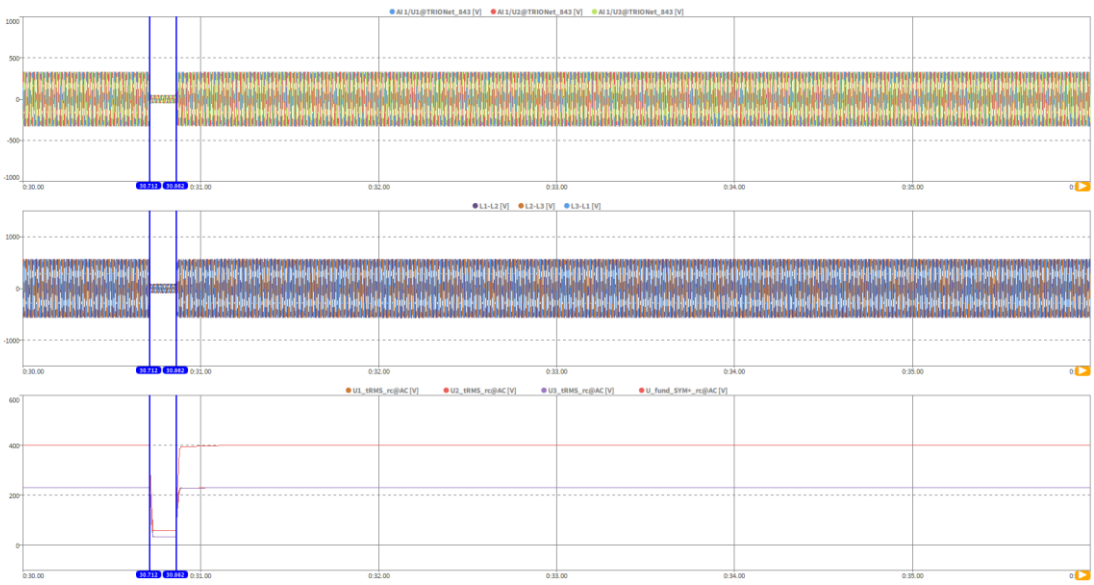
CME06-2BM250

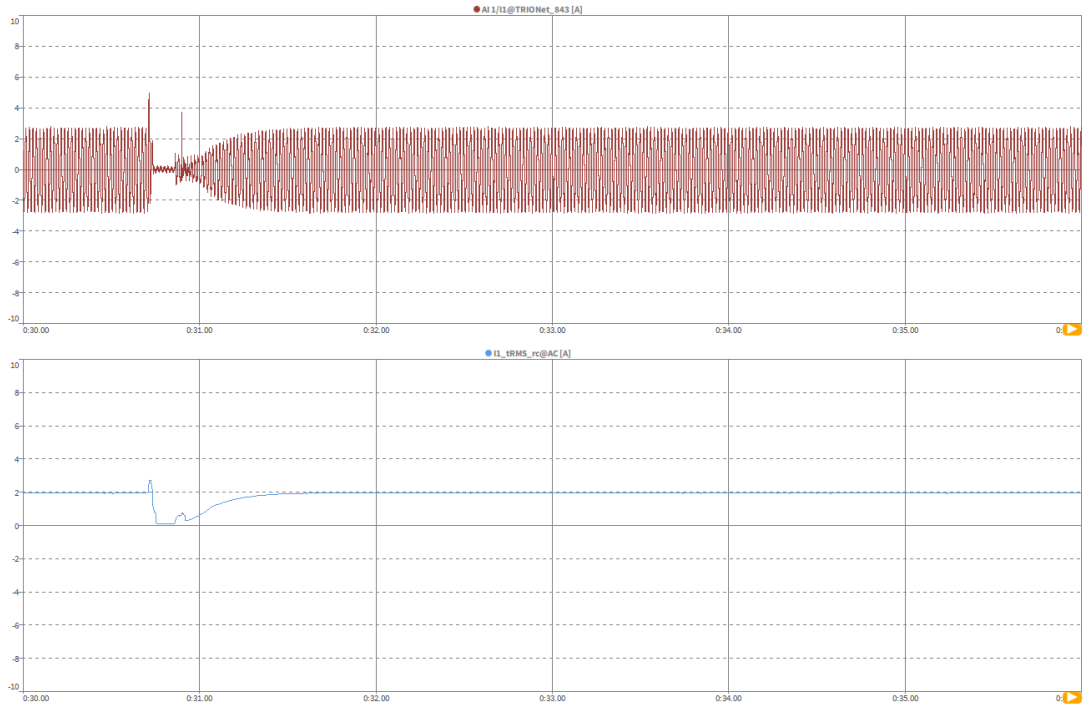
1.2

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1,2
	1	Date	--	--	yyyy.mm.dd	2026/2/9
	2	Time (start of test)	--	--	hh:mm:ss.f	11:03:18
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,15
	5	Setting dip duration		--	--	150
	6	Point of fault entry	Total	--	ms	30712
	7	Point of fault clearance	Total	--	ms	30862
	8	Fault duration in empty load test	Total	--	ms	150
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,150
	10		Total (Phase 2)			0,150
	11		Total (Phase 3)			0,149
	12		Positive sequence			0,149
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,998
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,298
	17	Active power	Total	t1-10s to t1	p.u.	0,297
	18		Pos.			0,297
	19	Reactive power	Total	t1-10s to t1	p.u.	0,029
	20		Pos.			0,007
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,150
	23		Phase 2			0,150
	24		Phase 3			0,149
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,017
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,016
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,000
	32		Pos.			0,000
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,297
	37		Pos.			0,297
	38	Active power rising time	Total	--	s	0,593
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,029
	40		Pos.			0,006
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

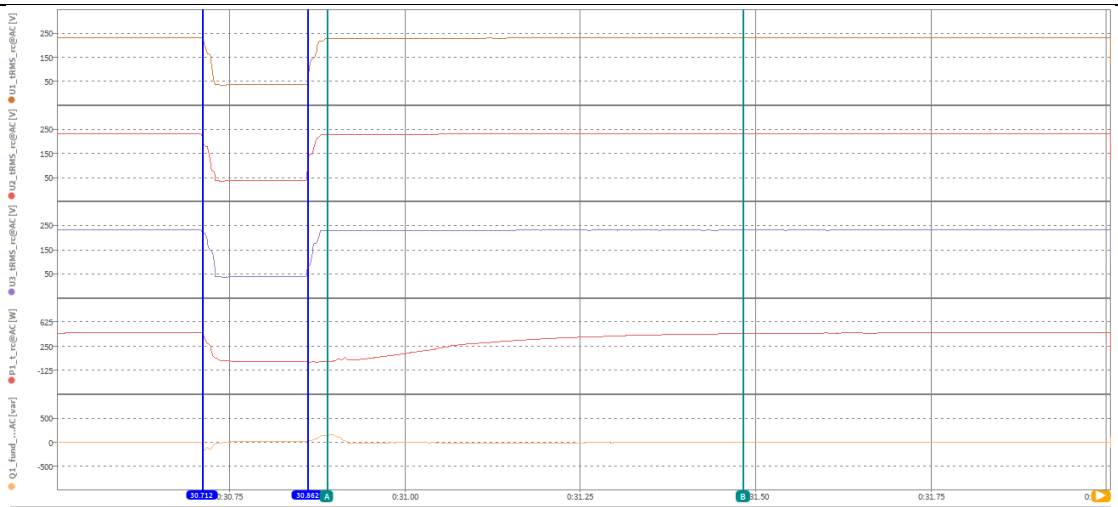
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:30.889373	0:31.482856	0.593483
U1_tRMS_rc@AC [V]	224.9352	230.5444	5.609283
U2_tRMS_rc@AC [V]	227.3357	230.9150	3.579330
U3_tRMS_rc@AC [V]	228.0969	230.3750	2.278137
P1_t_rc@AC [W]	-10.89308	434.5948	445.4878
Q1_fund_rc@AC [var]	120.4421	-18.27777	-138.7198

5.8.3	For PGUs Type 2 and storage systems	P

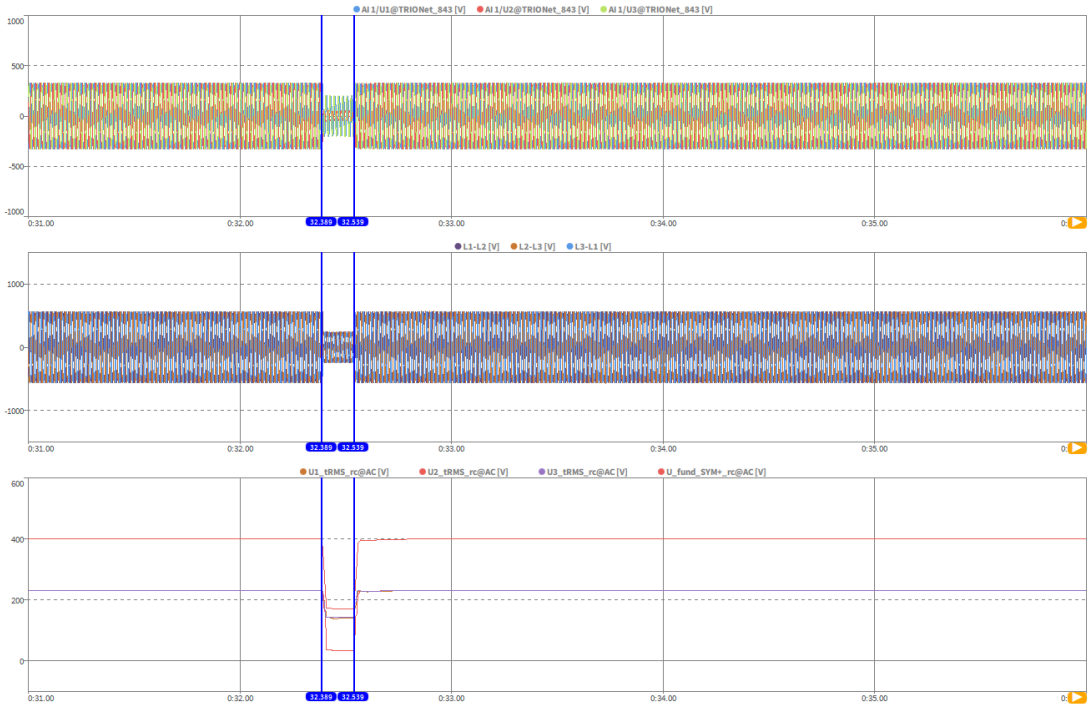
CME06-2BM250

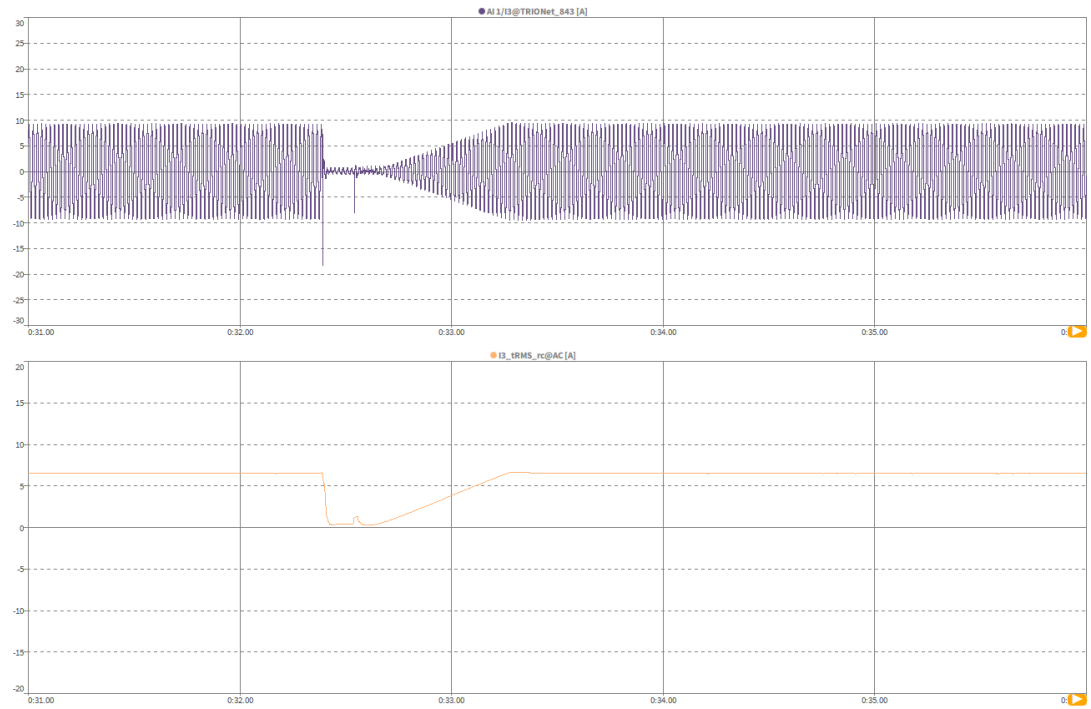
1.3

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1,3
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	10:46:00
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,15
	5	Setting dip duration		--	--	150
	6	Point of fault entry	Total	--	ms	32389
	7	Point of fault clearance	Total	--	ms	32539
	8	Fault duration in empty load test	Total	--	ms	150
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,617
	10		Total (Phase 2)			0,152
	11		Total (Phase 3)			0,617
	12		Positive sequence			0,428
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,997
	15		Phase 3			1,001
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,999
	17	Active power	Total	t1-10s to t1	p.u.	1,000
	18		Pos.			1,000
	19	Reactive power	Total	t1-10s to t1	p.u.	0,018
	20		Pos.			0,003
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,617
	23		Phase 2			0,152
	24		Phase 3			0,617
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,080
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,045
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,015
	32		Pos.			0,015
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,003
	34		Phase 2			0,999
	35		Phase 3			1,003
	36	Active power	Total	t2+3s to t2+10s	p.u.	1,000
	37		Pos.			1,000
	38	Active power rising time	Total	--	s	0,693
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,018
	40		Pos.			0,003
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

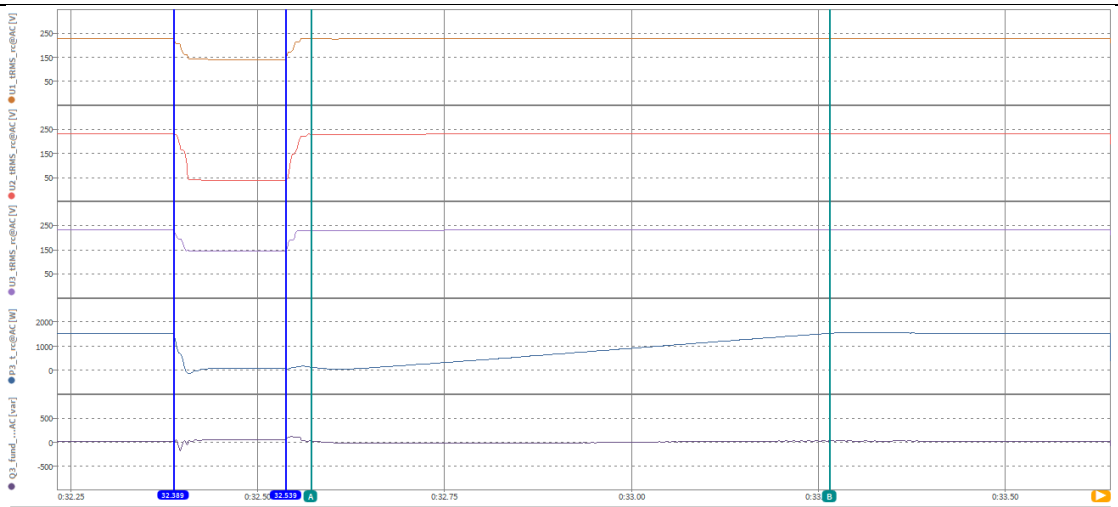
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:32.571949	0:33.265137	0.693188
U1_tRMS_rc@AC [V]	227.8838	230.1994	2.315628
U2_tRMS_rc@AC [V]	230.0080	230.9191	0.911133
U3_tRMS_rc@AC [V]	229.5096	230.9013	1.391708
P3_t_rc@AC [W]	90.95095	1509.107	1418.156
Q3_fund_rc@AC [var]	14.54744	8.971994	-5.575446

5.8.3	For PGUs Type 2 and storage systems	P

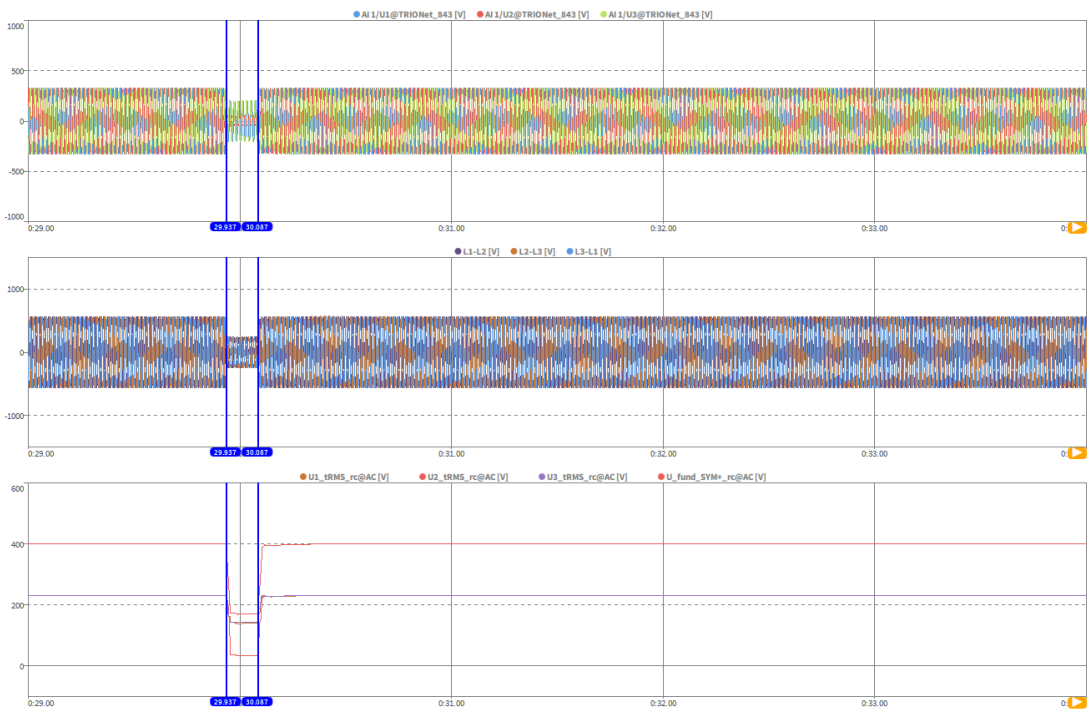
CME06-2BM250

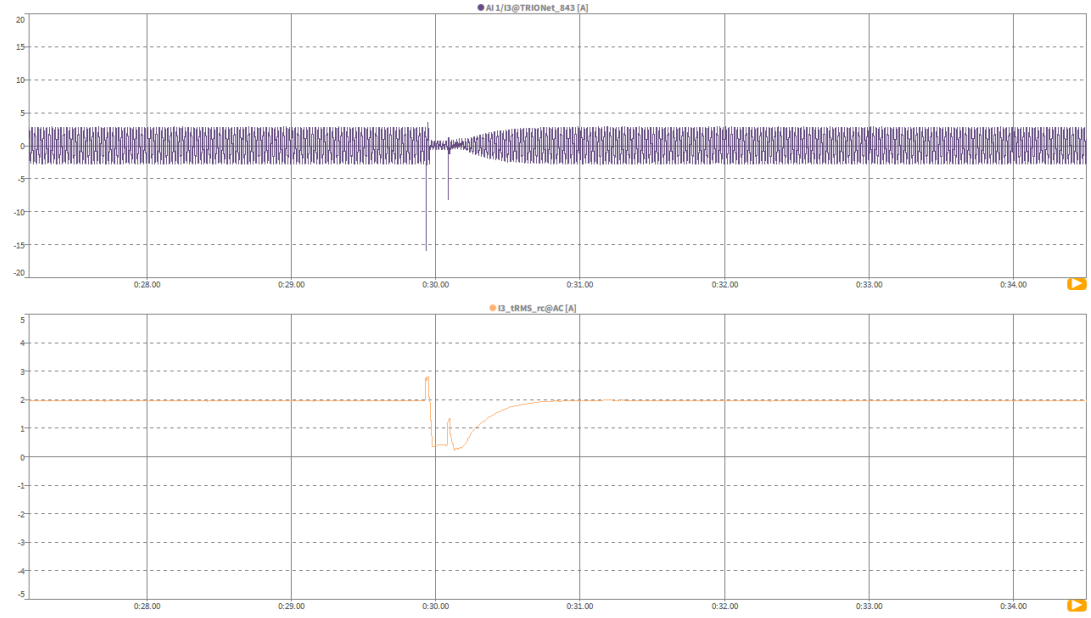
1.4

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1,4
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	10:48:42
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,15
	5	Setting dip duration		--	--	150
	6	Point of fault entry	Total	--	ms	29937
	7	Point of fault clearance	Total	--	ms	30087
	8	Fault duration in empty load test	Total	--	ms	150
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,617
	10		Total (Phase 2)			0,152
	11		Total (Phase 3)			0,617
	12		Positive sequence			0,247
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,000
	14		Phase 2			0,998
	15		Phase 3			1,000
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,302
	17	Active power	Total	t1-10s to t1	p.u.	0,301
	18		Pos.			0,301
	19	Reactive power	Total	t1-10s to t1	p.u.	0,029
	20		Pos.			0,007
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,617
	23		Phase 2			0,152
	24		Phase 3			0,617
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,081
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,042
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,013
	32		Pos.			0,013
	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,002
	34		Phase 2			0,999
	35		Phase 3			1,002
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,301
	37		Pos.			0,301
	38	Active power rising time	Total	--	s	0,568
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,028
	40		Pos.			0,007
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

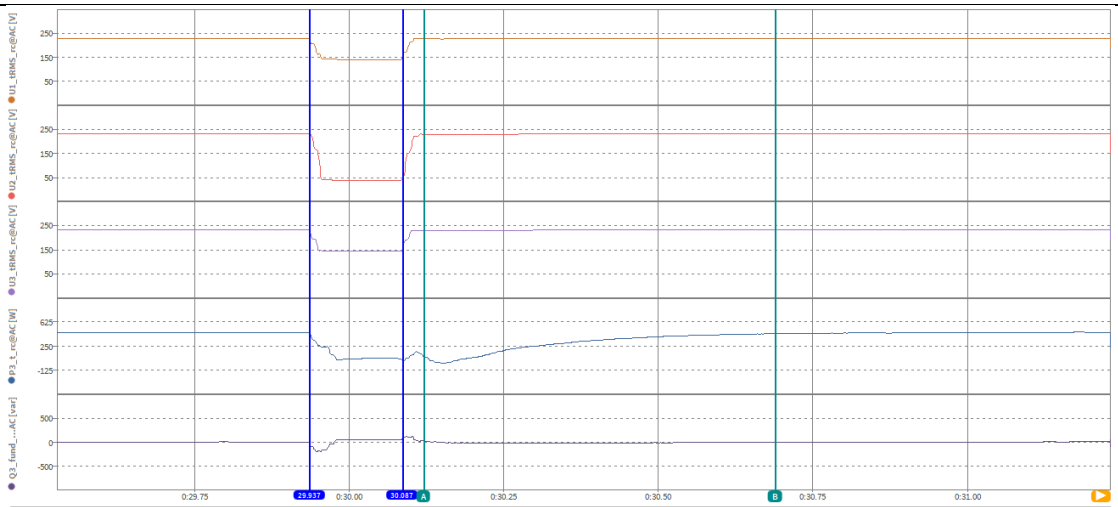
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:30.121112	0:30.689610	0.568498
U1_tRMS_rc@AC [V]	227.8823	230.2290	2.346634
U2_tRMS_rc@AC [V]	228.7117	230.9266	2.214951
U3_tRMS_rc@AC [V]	229.3926	230.7421	1.349472
P3_t_rc@AC [W]	102.8110	433.3490	330.5381
Q3_fund_rc@AC [var]	25.26478	-19.53990	-44.80468

5.8.3	For PGUs Type 2 and storage systems	P

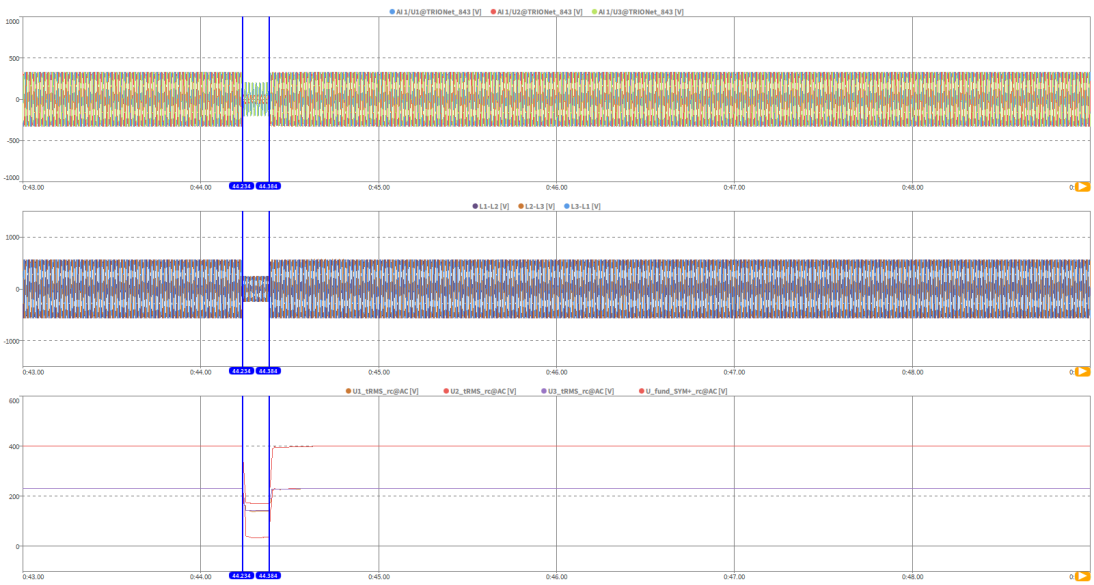
CME06-2BM250

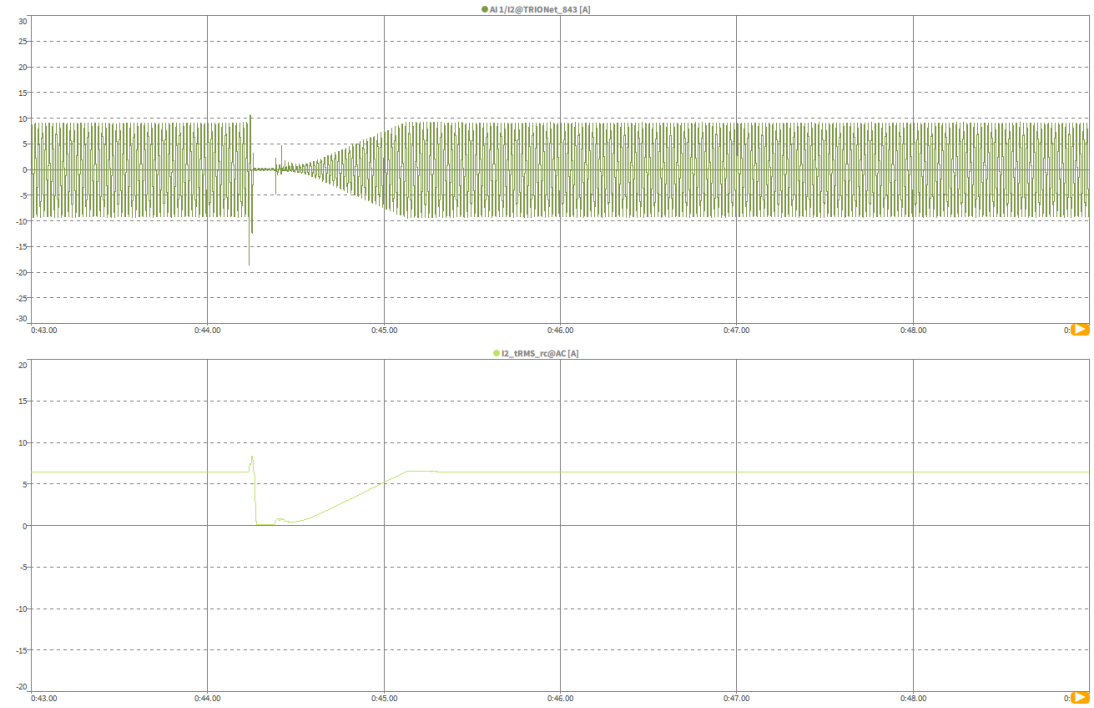
1.5

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1,5
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	13:46:02
	3	Fault type (phase)	--	--	--	D2
	4	Setting voltage depth	Line to line	--	p.u.	0,15
	5	Setting dip duration		--	--	150
	6	Point of fault entry	Total	--	ms	44234
	7	Point of fault clearance	Total	--	ms	44384
	8	Fault duration in empty load test	Total	--	ms	150
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,612
	10		Total (Phase 2)			0,154
	11		Total (Phase 3)			0,619
	12		Positive sequence			0,428
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			1,006
	15		Phase 3			1,002
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,984
	17	Active power	Total	t1-10s to t1	p.u.	0,990
	18		Pos.			0,990
	19	Reactive power	Total	t1-10s to t1	p.u.	0,019
	20		Pos.			0,003
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,610
	23		Phase 2			0,154
	24		Phase 3			0,619
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			0,015
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			0,015
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,000
	32		Pos.			0,000
	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			1,006
	35		Phase 3			1,002
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,990
	37		Pos.			0,990
	38	Active power rising time	Total	--	s	0,743
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,019
	40		Pos.			0,003
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

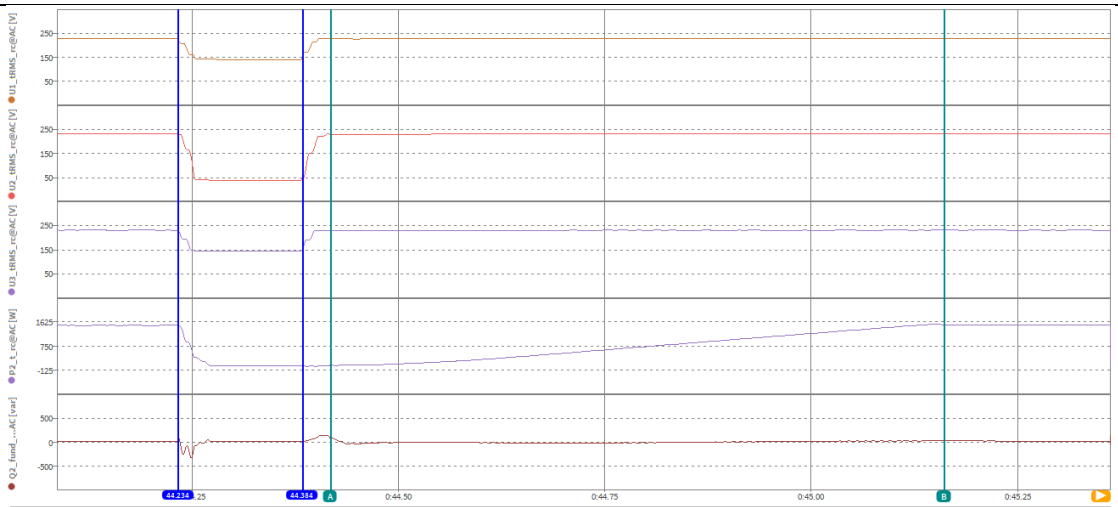
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:44.418282	0:45.161097	0.742815
U1_tRMS_rc@AC [V]	227.8864	230.1845	2.298080
U2_tRMS_rc@AC [V]	229.4980	231.4288	1.930847
U3_tRMS_rc@AC [V]	229.1440	230.3887	1.244705
P2_t_rc@AC [W]	8.188134	1514.546	1506.358
Q2_fund_rc@AC [var]	109.2256	12.44459	-96.78102

5.8.3	For PGUs Type 2 and storage systems	P

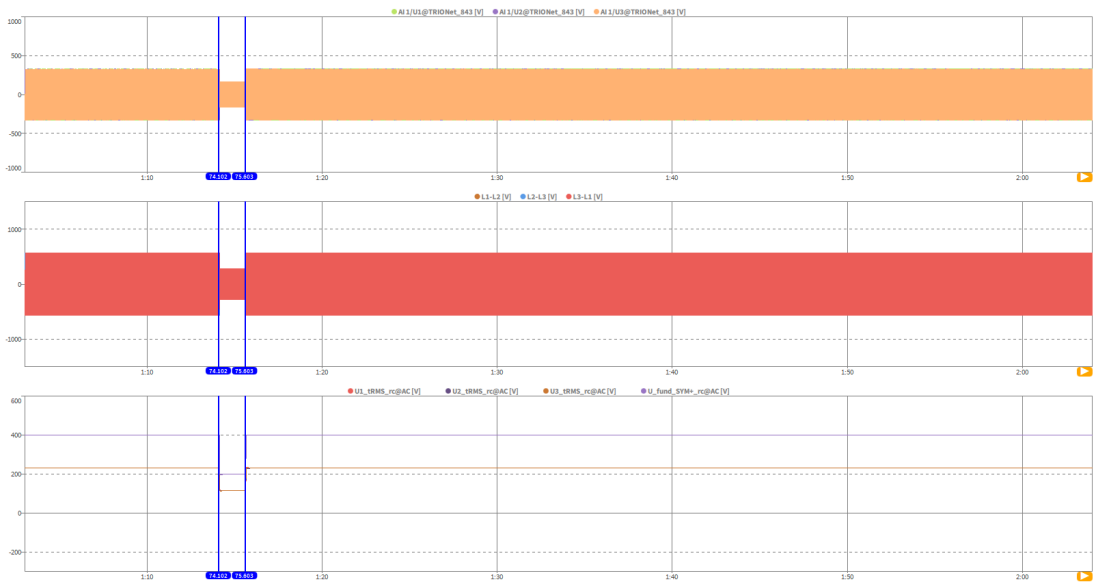
CME06-2BM250

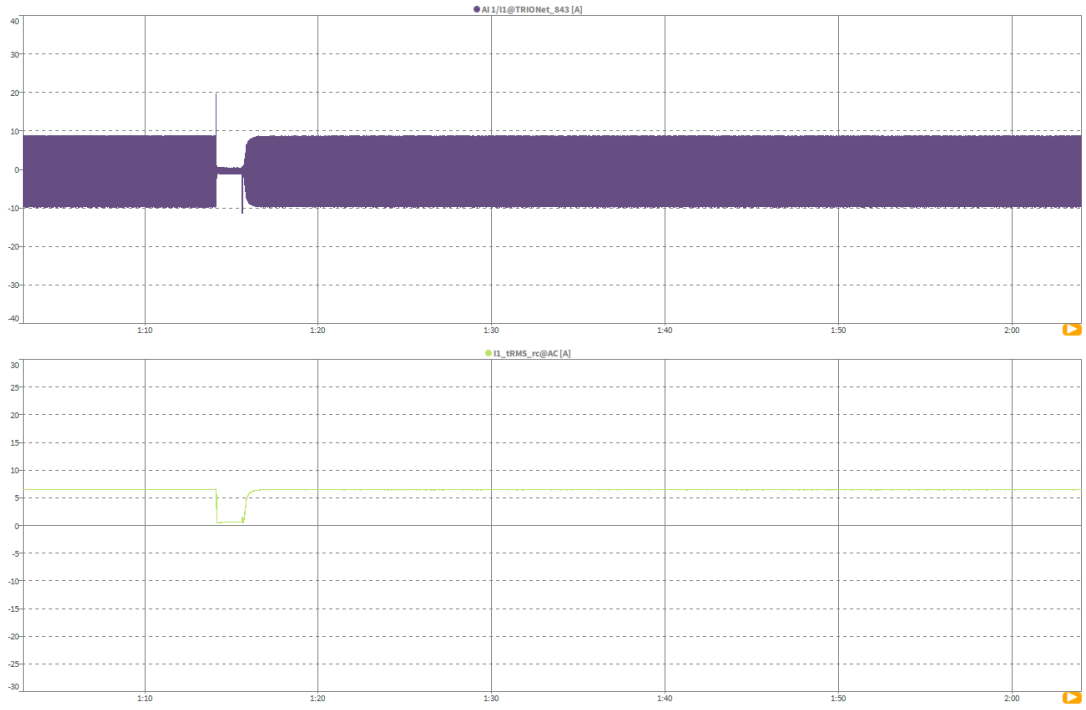
2.1

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2,1
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	14:21:34
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	74102
	7	Point of fault clearance	Total	--	ms	75603
	8	Fault duration in empty load test	Total	--	ms	1501
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,500
	10		Total (Phase 2)			0,498
	11		Total (Phase 3)			0,497
	12		Positive sequence			0,496
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,002
	14		Phase 2			0,998
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,986
	17	Active power	Total	t1-10s to t1	p.u.	0,938
	18		Pos.			0,938
	19	Reactive power	Total	t1-10s to t1	p.u.	0,318
	20		Pos.			0,310
	21	Cosφ	Total	t1-10s to t1	--	0,950
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,500
	23		Phase 2			0,498
	24		Phase 3			0,497
	25	Line current	Phase 1	t1+60ms	p.u.	0,070
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,080
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,020
	32		Pos.			0,020
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,006
	34		Phase 2			0,998
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,938
	37		Pos.			0,938
	38	Active power rising time	Total	--	s	0,787
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,320
	40		Pos.			0,311
	41	Reactive power rising time	total	--	s	9,555
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

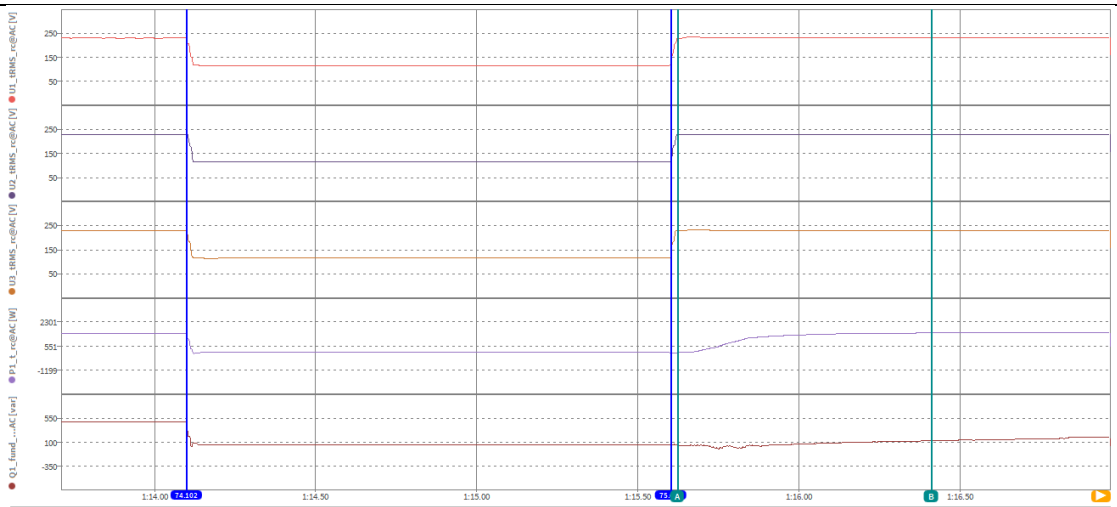
CME06-2BM250



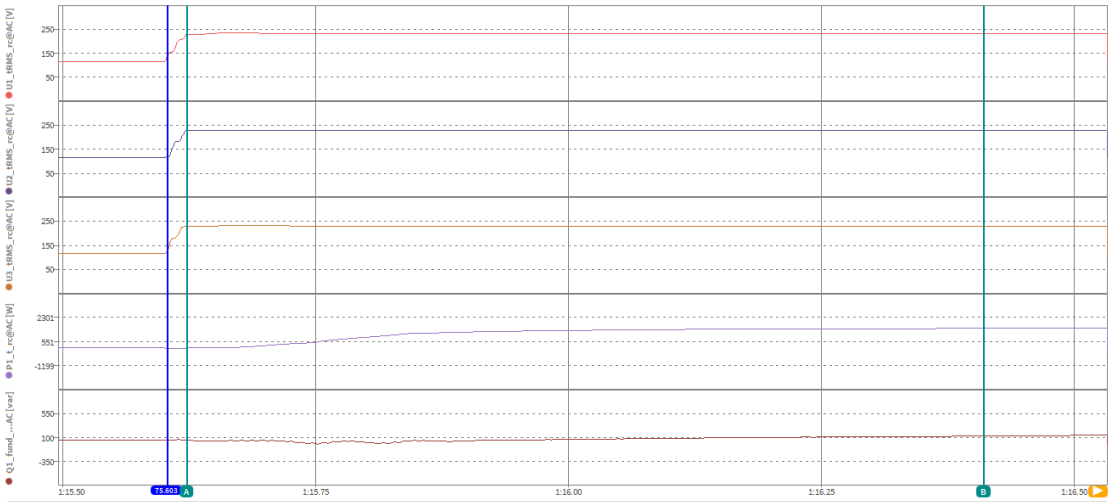


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



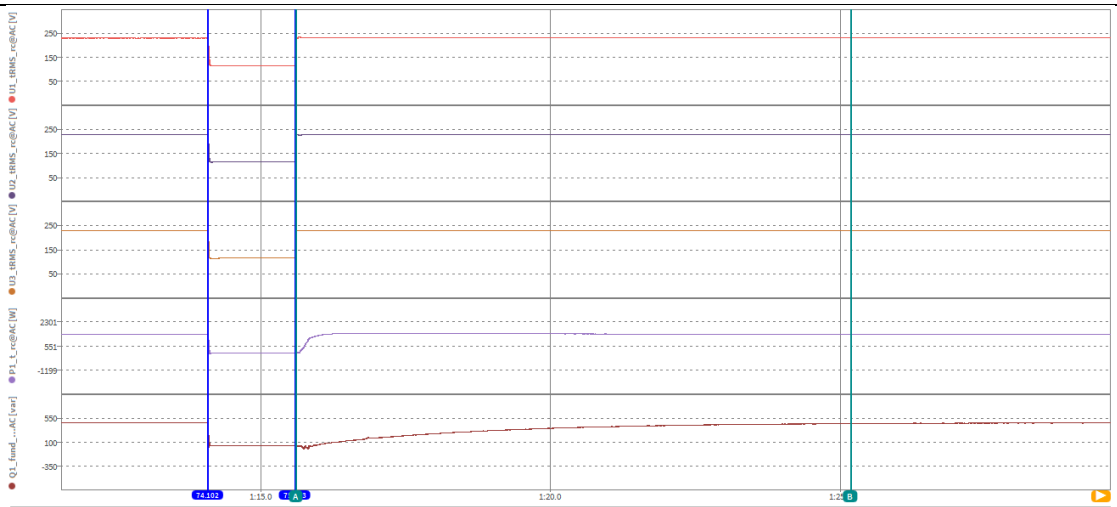
	A	B	Delta
Time [s]	1:15.6233	1:16.4104	0.7871
U1_tRMS_rc@AC [V]	222.3624	231.4688	9.106323
U2_tRMS_rc@AC [V]	225.7612	229.4931	3.731903
U3_tRMS_rc@AC [V]	226.9879	229.6524	2.664474
P1_t_rc@AC [W]	-13.14182	1461.907	1475.049
Q1_fund_rc@AC [var]	31.96233	114.0370	82.07471



	A	B	Delta
Time [s]	1:15.6233	1:16.4104	0.7871
U1_tRMS_rc@AC [V]	222.3624	231.4688	9.106323
U2_tRMS_rc@AC [V]	225.7612	229.4931	3.731903
U3_tRMS_rc@AC [V]	226.9879	229.6524	2.664474
P1_t_rc@AC [W]	-13.14182	1461.907	1475.049
Q1_fund_rc@AC [var]	31.96233	114.0370	82.07471

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	1:15.6233	1:25.1787	9.5554
U1_tRMS_rc@AC [V]	222.3624	231.3263	8.963882
U2_tRMS_rc@AC [V]	225.7612	229.4630	3.701874
U3_tRMS_rc@AC [V]	226.9879	229.5535	2.565536
P1_t_rc@AC [W]	-13.14182	1411.388	1424.530
Q1_fund_rc@AC [var]	31.96233	447.4734	415.5111

5.8.3	For PGUs Type 2 and storage systems	P

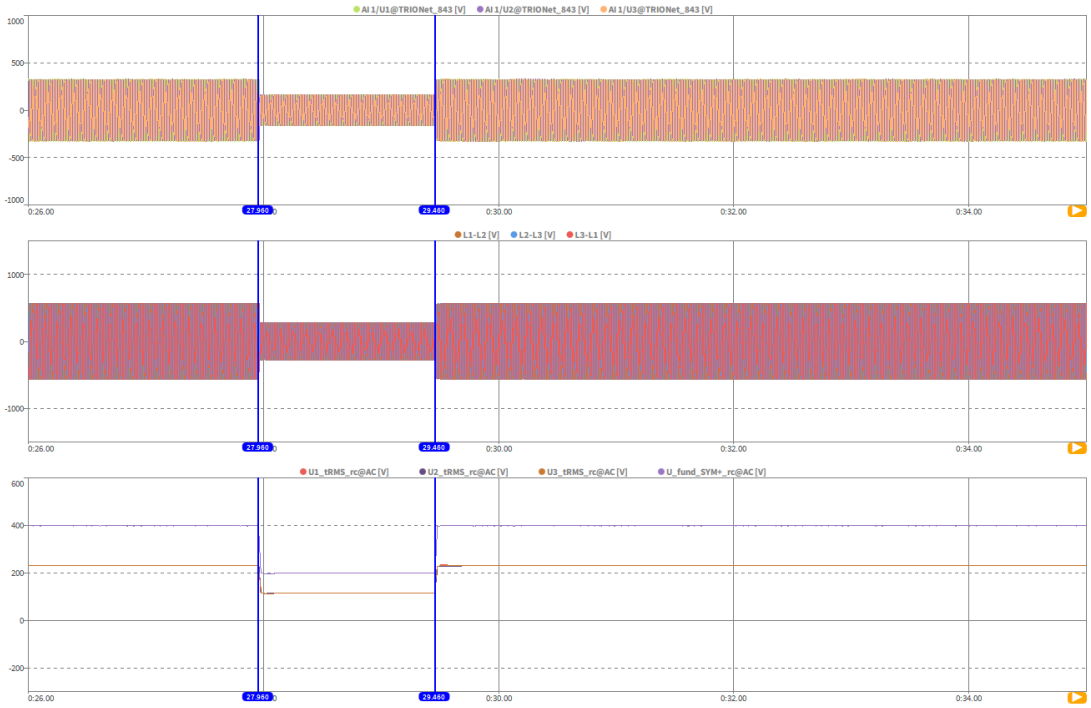
CME06-2BM250

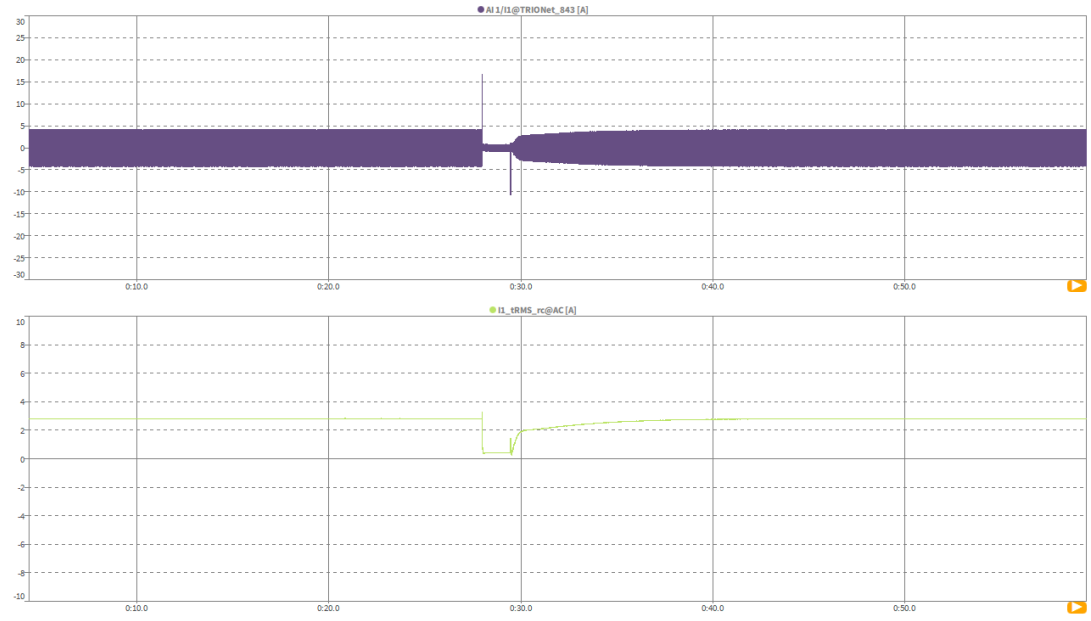
2.2

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2,2
	1	Date	--	--	yyyy.mm.dd	2026/2/10
	2	Time (start of test)	--	--	hh:mm:ss.f	20:44:33
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	27960
	7	Point of fault clearance	Total	--	ms	29460
	8	Fault duration in empty load test	Total	--	ms	1500
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,500
	10		Total (Phase 2)			0,498
	11		Total (Phase 3)			0,497
	12		Positive sequence			0,496
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,998
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,428
	17	Active power	Total	t1-10s to t1	p.u.	0,296
	18		Pos.			0,296
	19	Reactive power	Total	t1-10s to t1	p.u.	0,313
	20		Pos.			0,310
	21	Cosφ	Total	t1-10s to t1	--	0,691
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,500
	23		Phase 2			0,498
	24		Phase 3			0,497
	25	Line current	Phase 1	t1+60ms	p.u.	0,057
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,068
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,019
	32		Pos.			0,019
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,296
	37		Pos.			0,296
	38	Active power rising time	Total	--	s	0,818
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,279
	40		Pos.			0,275
	41	Reactive power rising time	total	--	s	9,725
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

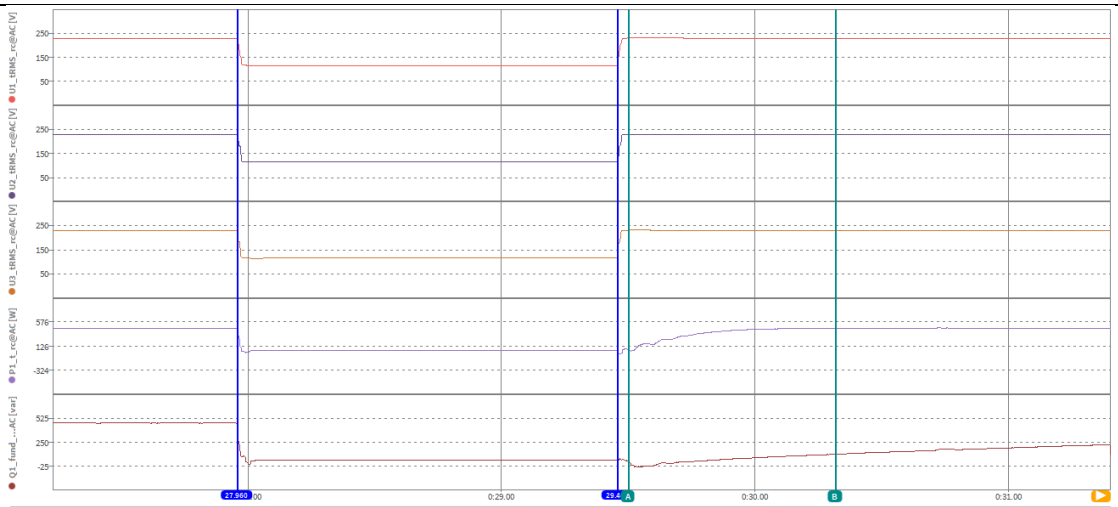
CME06-2BM250



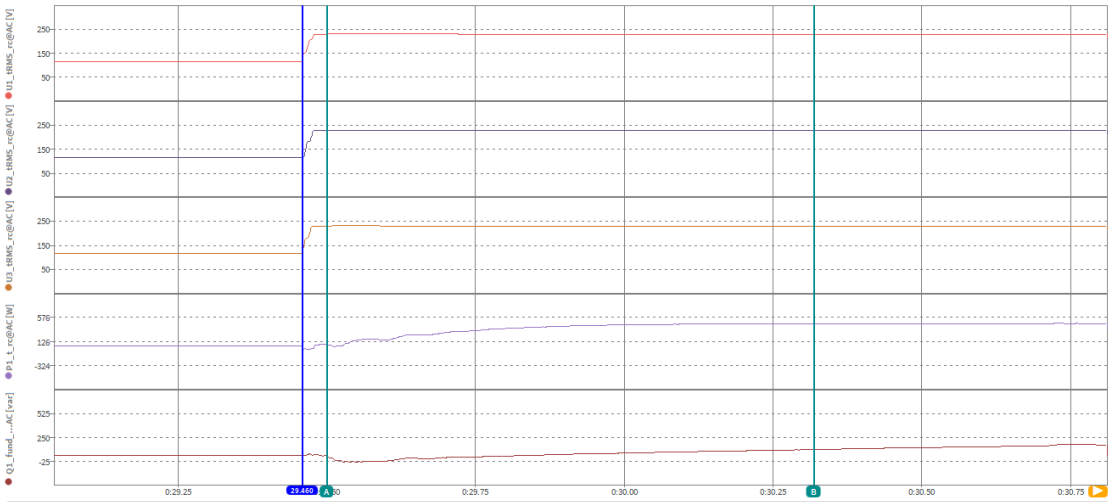


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



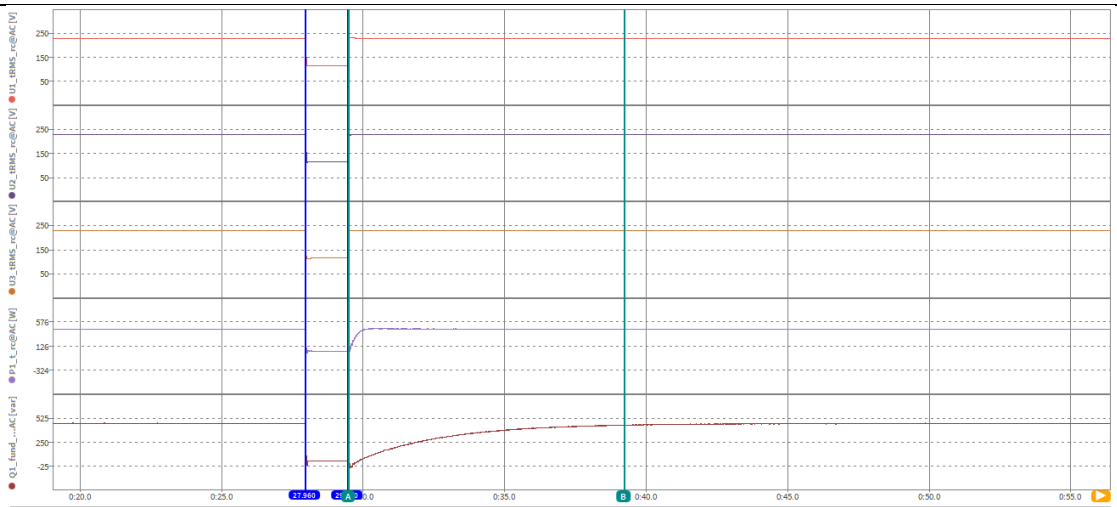
	A	B	Delta	RMS
Time [s]	0:29.5014	0:30.3190	0.8175	
U1_tRMS_rc@AC [V]	230.0611	230.1358	0.074753	230.5531
U2_tRMS_rc@AC [V]	228.0996	229.4108	1.311142	229.1002
U3_tRMS_rc@AC [V]	228.8685	229.5950	0.726471	229.7999
P1_t_rc@AC [W]	54.83836	450.7327	395.8943	369.8805
Q1_fund_rc@AC [var]	31.89112	101.2248	69.33370	57.95745



	A	B	Delta	RMS
Time [s]	0:29.5014	0:30.3190	0.8175	
U1_tRMS_rc@AC [V]	230.0611	230.1358	0.074753	230.5531
U2_tRMS_rc@AC [V]	228.0996	229.4108	1.311142	229.1002
U3_tRMS_rc@AC [V]	228.8685	229.5950	0.726471	229.7999
P1_t_rc@AC [W]	54.83836	450.7327	395.8943	369.8805
Q1_fund_rc@AC [var]	31.89112	101.2248	69.33370	57.95745

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta	RMS
Time [s]	0:29.5014	0:39.2262	9.7247	
U1_tRMS_rc@AC [V]	230.0611	230.0433	-0.017807	230.1748
U2_tRMS_rc@AC [V]	228.0996	229.4439	1.344315	229.4290
U3_tRMS_rc@AC [V]	228.8685	229.5888	0.720230	229.6268
P1_t_rc@AC [W]	54.83836	443.7509	388.9126	439.6456
Q1_fund_rc@AC [var]	31.89112	445.7983	413.9072	345.5567

5.8.3	For PGUs Type 2 and storage systems	P

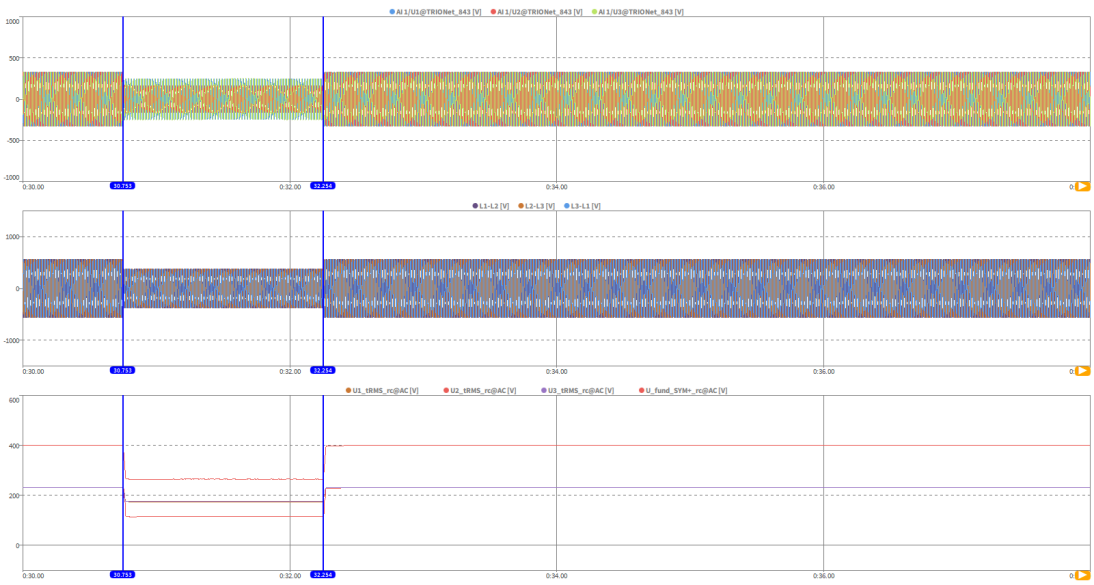
CME06-2BM250

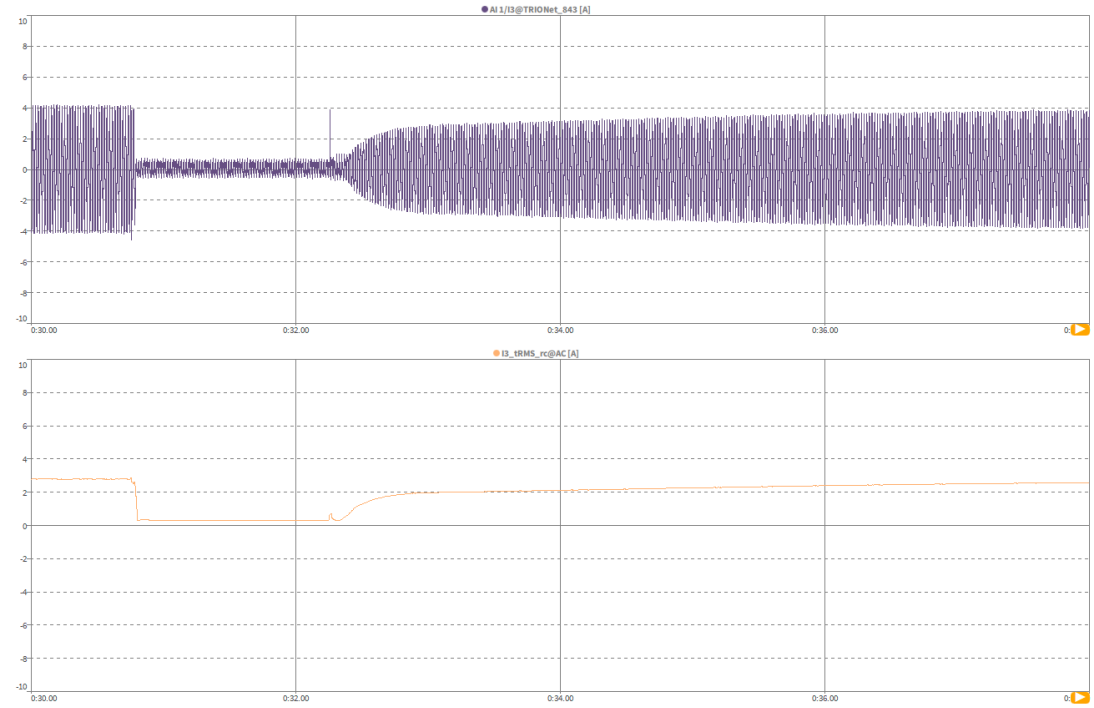
2.3

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2,3
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	11:35:17
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	30753
	7	Point of fault clearance	Total	--	ms	32254
	8	Fault duration in empty load test	Total	--	ms	1501
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,759
	10		Total (Phase 2)			0,499
	11		Total (Phase 3)			0,759
	12		Positive sequence			0,382
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,997
	15		Phase 3			1,001
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,993
	17	Active power	Total	t1-10s to t1	p.u.	0,937
	18		Pos.			0,937
	19	Reactive power	Total	t1-10s to t1	p.u.	0,317
	20		Pos.			0,314
	21	Cosφ	Total	t1-10s to t1	--	0,948
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,759
	23		Phase 2			0,499
	24		Phase 3			0,759
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,093
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,043
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,029
	32		Pos.			0,029
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,002
	34		Phase 2			0,998
	35		Phase 3			1,002
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,950
	37		Pos.			0,950
	38	Active power rising time	Total	--	s	0,664
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,276
	40		Pos.			0,274
	41	Reactive power rising time	total	--	s	9,786
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

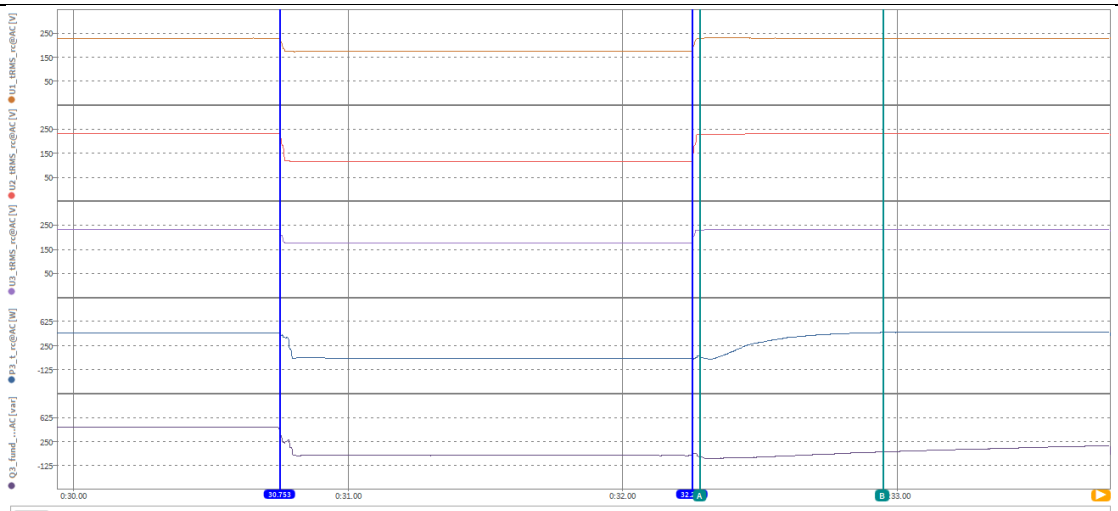
CME06-2BM250



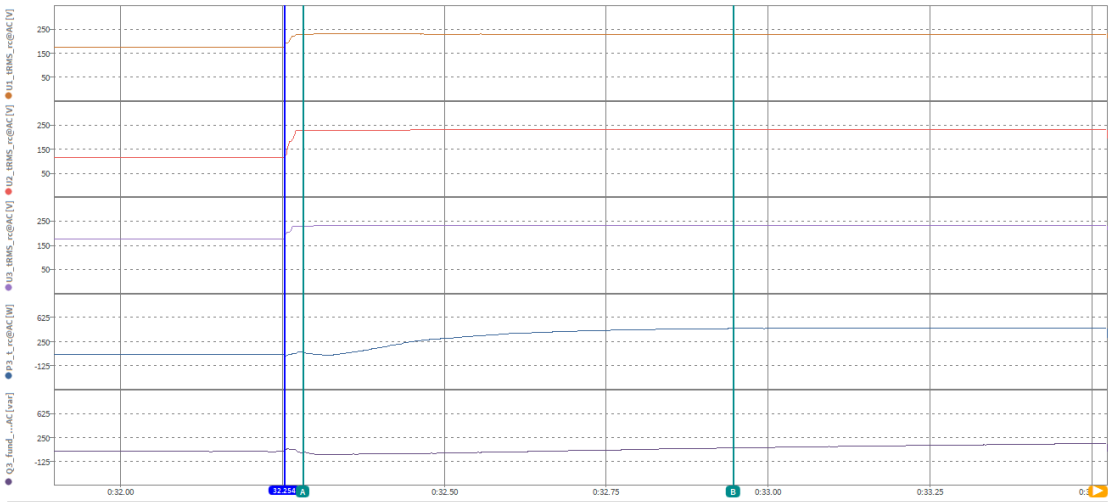


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



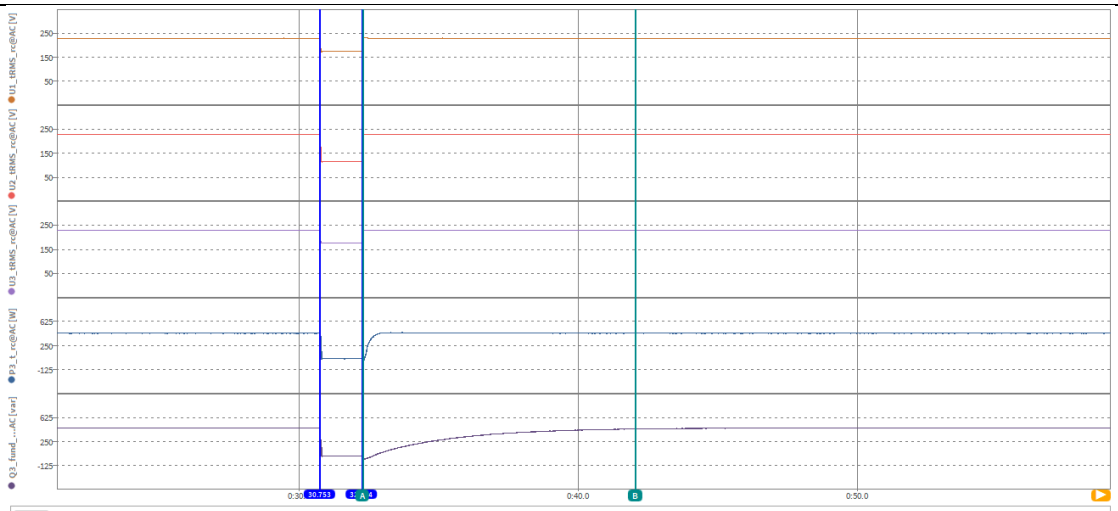
	A	B	Delta
Time [s]	0:32.2825	0:32.9468	0.6642
U1_tRMS_rc@AC [V]	229.3996	230.2511	0.851501
U2_tRMS_rc@AC [V]	229.4282	230.9276	1.499390
U3_tRMS_rc@AC [V]	229.9836	230.7860	0.802399
P3_t_rc@AC [W]	70.82664	446.4591	375.6325
Q3_fund_rc@AC [var]	-1.586560	72.92797	74.51453



	A	B	Delta
Time [s]	0:32.2825	0:32.9468	0.6642
U1_tRMS_rc@AC [V]	229.3996	230.2511	0.851501
U2_tRMS_rc@AC [V]	229.4282	230.9276	1.499390
U3_tRMS_rc@AC [V]	229.9836	230.7860	0.802399
P3_t_rc@AC [W]	70.82664	446.4591	375.6325
Q3_fund_rc@AC [var]	-1.586560	72.92797	74.51453

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:32.2825	0:42.0685	9.7860
U1_tRMS_rc@AC [V]	229.3996	230.2814	0.881821
U2_tRMS_rc@AC [V]	229.4282	230.9674	1.539185
U3_tRMS_rc@AC [V]	229.9836	230.7586	0.775070
P3_t_rc@AC [W]	70.82664	438.1326	367.3060
Q3_fund_rc@AC [var]	-1.586560	445.4966	447.0831

5.8.3	For PGUs Type 2 and storage systems	P

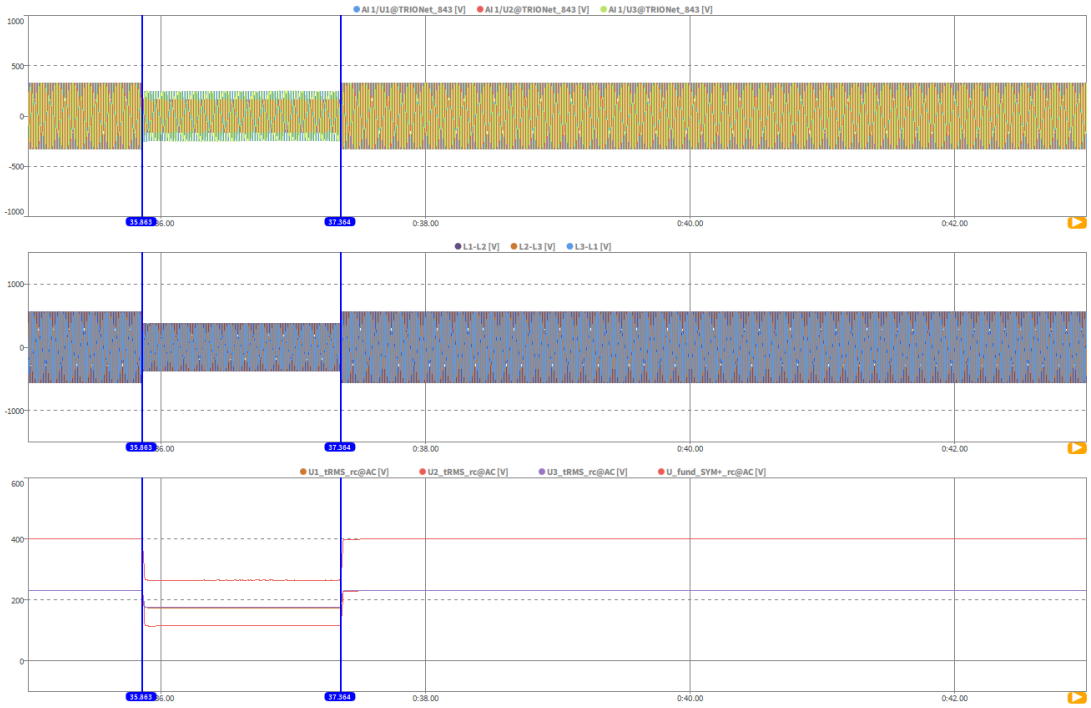
CME06-2BM250

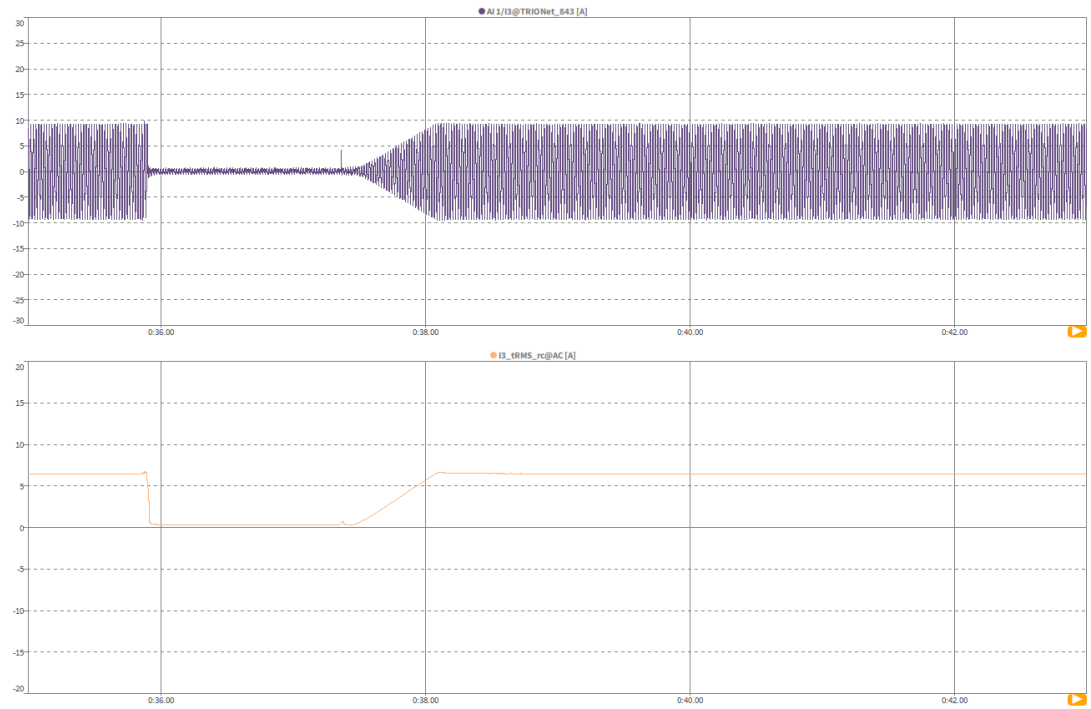
2.4

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2,4
	1	Date	--	--	yyyy.mm.dd	2024/11/15
	2	Time (start of test)	--	--	hh:mm:ss.f	11:06:05
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	35863
	7	Point of fault clearance	Total	--	ms	37364
	8	Fault duration in empty load test	Total	--	ms	1501
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,759
	10		Total (Phase 2)			0,499
	11		Total (Phase 3)			0,759
	12		Positive sequence			0,381
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,000
	14		Phase 2			0,997
	15		Phase 3			1,000
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,424
	17	Active power	Total	t1-10s to t1	p.u.	0,293
	18		Pos.			0,293
	19	Reactive power	Total	t1-10s to t1	p.u.	0,309
	20		Pos.			0,306
	21	Cosφ	Total	t1-10s to t1	--	0,693
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,759
	23		Phase 2			0,499
	24		Phase 3			0,759
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,067
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,040
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,028
	32		Pos.			0,028
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			1,001
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,293
	37		Pos.			0,293
	38	Active power rising time	Total	--	s	0,750
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,306
	40		Pos.			0,303
	41	Reactive power rising time	total	--	s	9,514
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

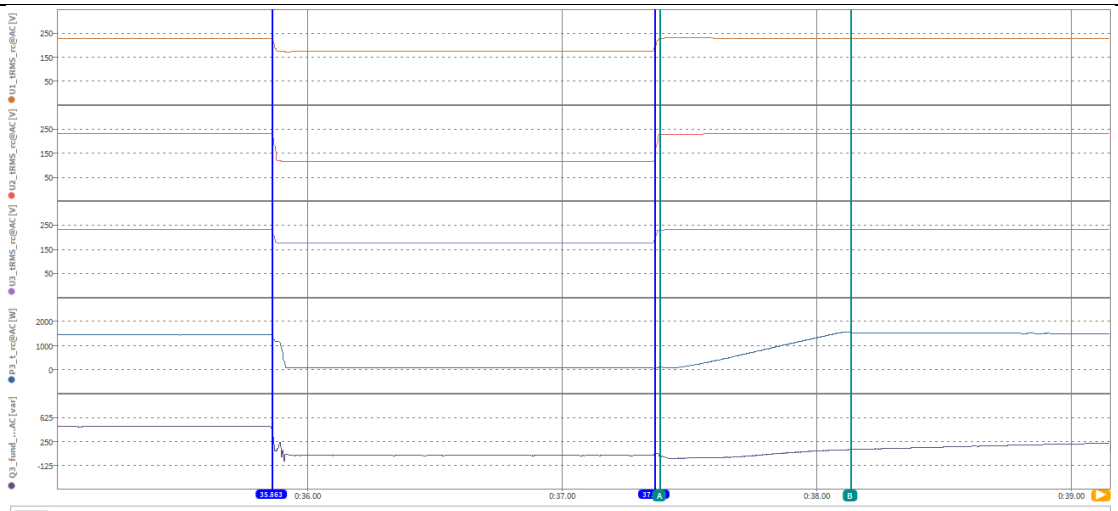
CME06-2BM250



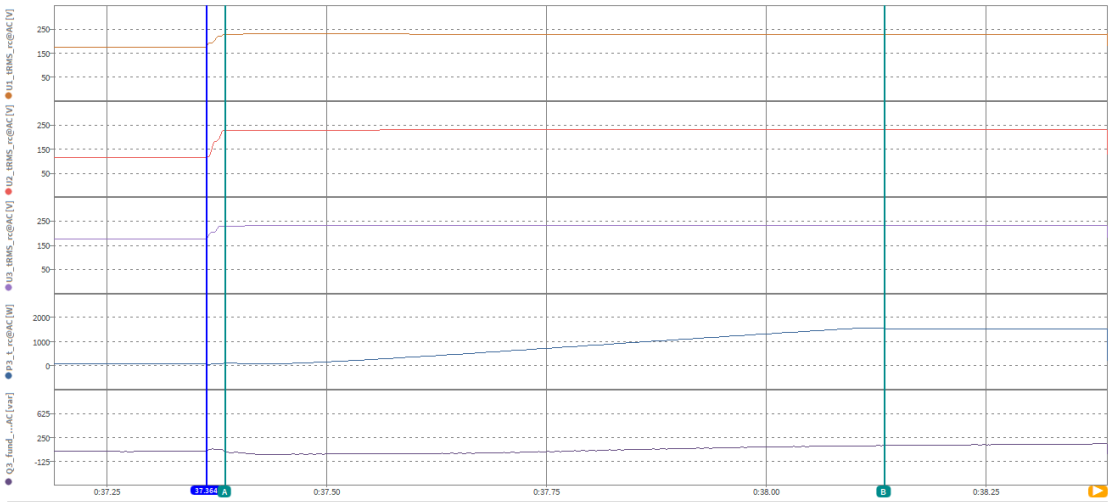


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



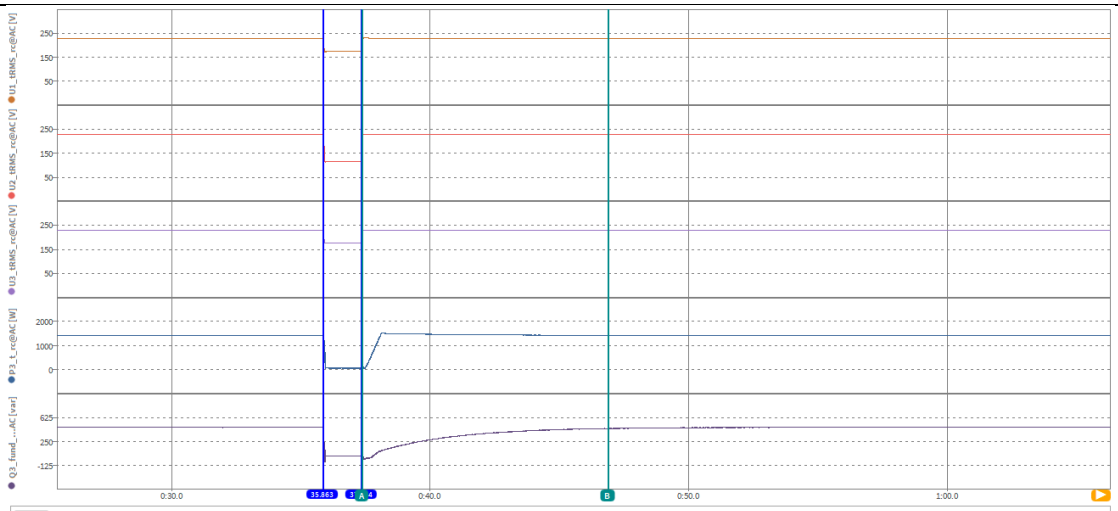
	A	B	Delta
Time [s]	0:37.3844	0:38.1341	0.7497
U1_tRMS_rc@AC [V]	229.2856	230.1881	0.902451
U2_tRMS_rc@AC [V]	229.5533	230.8965	1.343170
U3_tRMS_rc@AC [V]	229.8190	230.9168	1.097778
P3_t_rc@AC [W]	57.02929	1518.609	1461.580
Q3_fund_rc@AC [var]	35.99686	110.3018	74.30490



	A	B	Delta
Time [s]	0:37.3844	0:38.1341	0.7497
U1_tRMS_rc@AC [V]	229.2856	230.1881	0.902451
U2_tRMS_rc@AC [V]	229.5533	230.8965	1.343170
U3_tRMS_rc@AC [V]	229.8190	230.9168	1.097778
P3_t_rc@AC [W]	57.02929	1518.609	1461.580
Q3_fund_rc@AC [var]	35.99686	110.3018	74.30490

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:37.3844	0:46.8982	9.5137
U1_tRMS_rc@AC [V]	229.2856	230.1992	0.913589
U2_tRMS_rc@AC [V]	229.5533	230.8820	1.328659
U3_tRMS_rc@AC [V]	229.8190	230.8812	1.062195
P3_t_rc@AC [W]	57.02929	1419.064	1362.035
Q3_fund_rc@AC [var]	35.99686	454.9364	418.9395

5.8.3	For PGUs Type 2 and storage systems	P

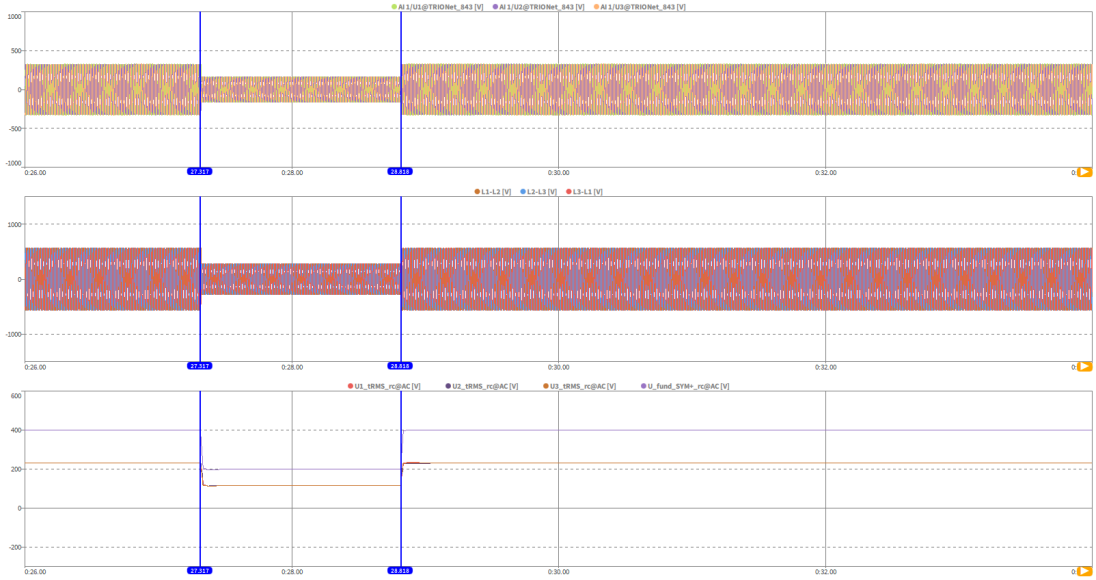
CME06-2BM250

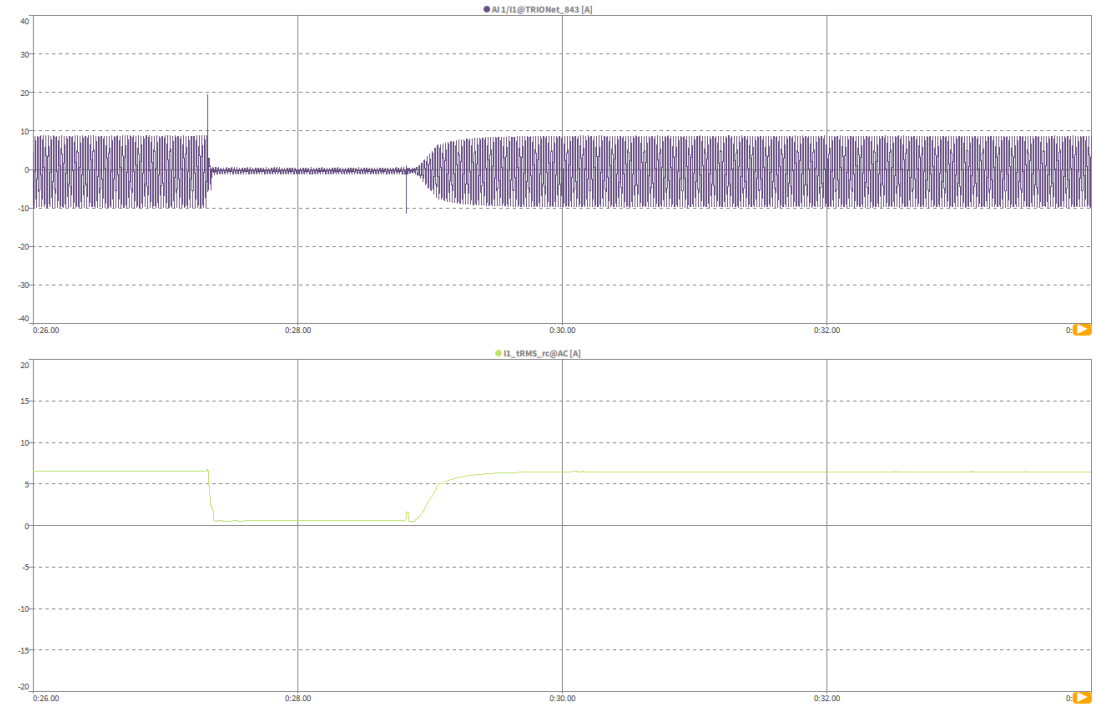
3.1

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3,1
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	14:25:27
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	31361
	7	Point of fault clearance	Total	--	ms	32862
	8	Fault duration in empty load test	Total	--	ms	1501
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,500
	10		Total (Phase 2)			0,498
	11		Total (Phase 3)			0,497
	12		Positive sequence			0,496
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,002
	14		Phase 2			0,997
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,997
	17	Active power	Total	t1-10s to t1	p.u.	0,946
	18		Pos.			0,946
	19	Reactive power	Total	t1-10s to t1	p.u.	-0,321
	20		Pos.			-0,309
	21	Cosφ	Total	t1-10s to t1	--	0,950
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,500
	23		Phase 2			0,498
	24		Phase 3			0,497
	25	Line current	Phase 1	t1+60ms	p.u.	0,084
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,086
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,020
	32		Pos.			0,020
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,006
	34		Phase 2			0,997
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,946
	37		Pos.			0,946
	38	Active power rising time	Total	--	s	0,738
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	-0,320
	40		Pos.			-0,308
	41	Reactive power rising time	total	--	s	9,589
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

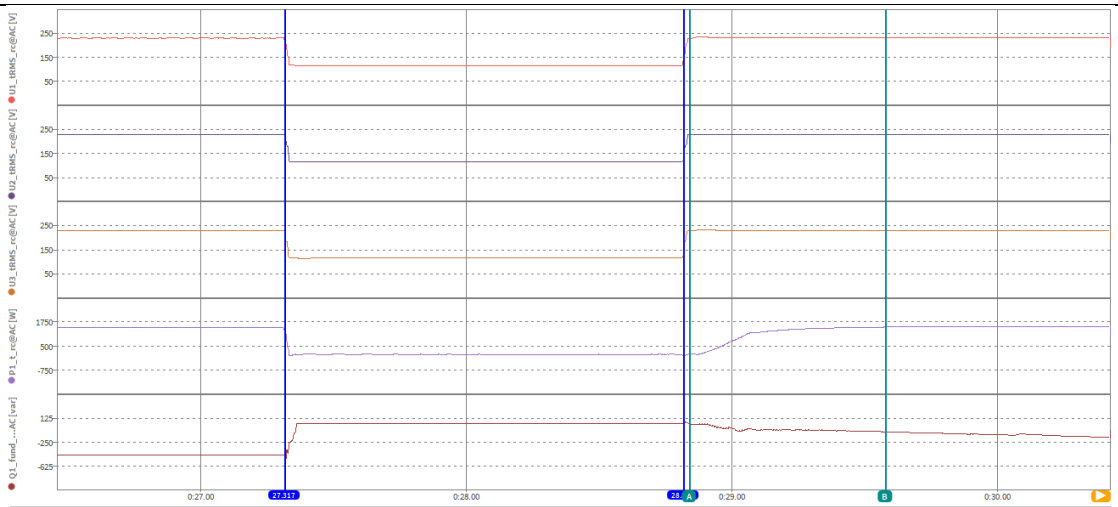
CME06-2BM250



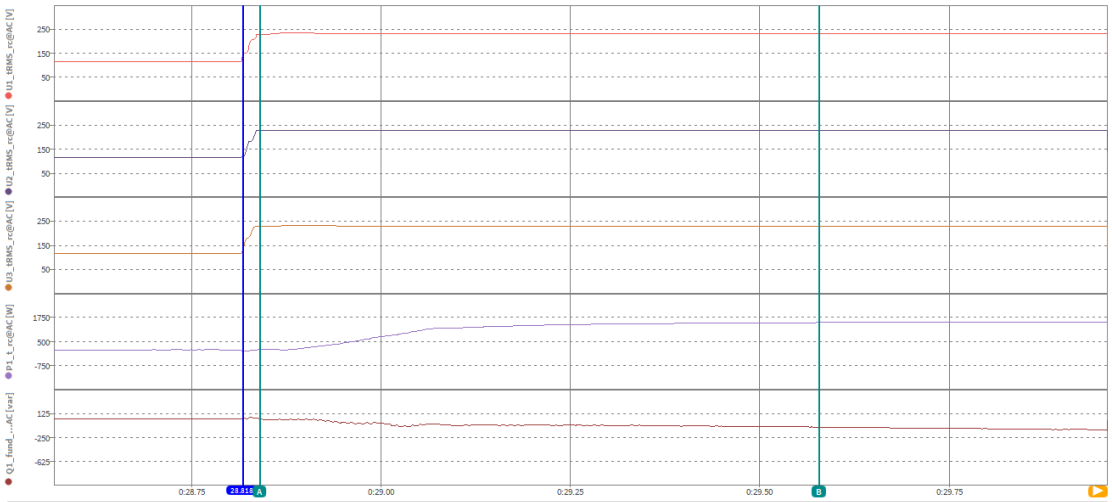


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



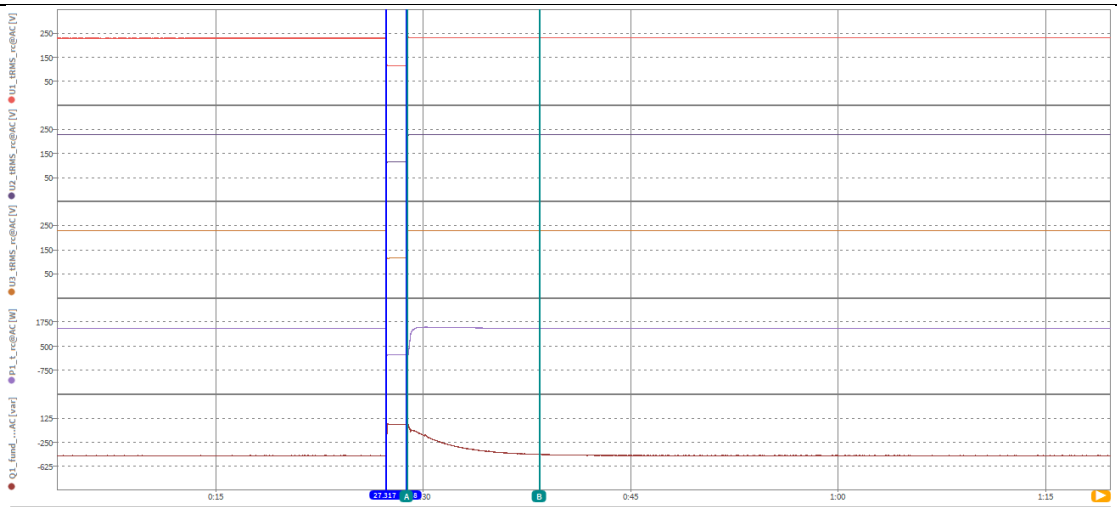
	A	B	Delta
Time [s]	0:28.8408	0:29.5786	0.7378
U1_tRMS_rc@AC [V]	229.4493	231.3847	1.935410
U2_tRMS_rc@AC [V]	228.2603	229.3637	1.103409
U3_tRMS_rc@AC [V]	228.3576	229.6340	1.276459
P1_t_rc@AC [W]	59.64672	1460.862	1401.215
Q1_fund_rc@AC [var]	46.24910	-98.84355	-145.0927



	A	B	Delta
Time [s]	0:28.8408	0:29.5786	0.7378
U1_tRMS_rc@AC [V]	229.4493	231.3847	1.935410
U2_tRMS_rc@AC [V]	228.2603	229.3637	1.103409
U3_tRMS_rc@AC [V]	228.3576	229.6340	1.276459
P1_t_rc@AC [W]	59.64672	1460.862	1401.215
Q1_fund_rc@AC [var]	46.24910	-98.84355	-145.0927

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:28.8408	0:38.4302	9.5894
U1_tRMS_rc@AC [V]	229.4493	231.3056	1.856293
U2_tRMS_rc@AC [V]	228.2603	229.3974	1.137177
U3_tRMS_rc@AC [V]	228.3576	229.6610	1.303467
P1_t_rc@AC [W]	59.64672	1422.543	1362.896
Q1_fund_rc@AC [var]	46.24910	-445.2215	-491.4706

5.8.3	For PGUs Type 2 and storage systems	P

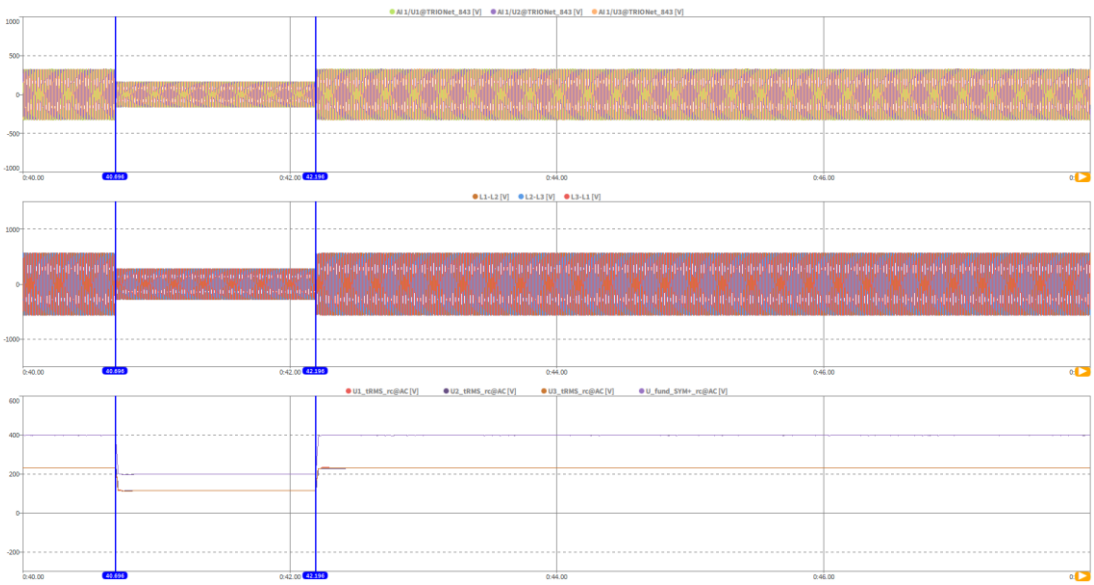
CME06-2BM250

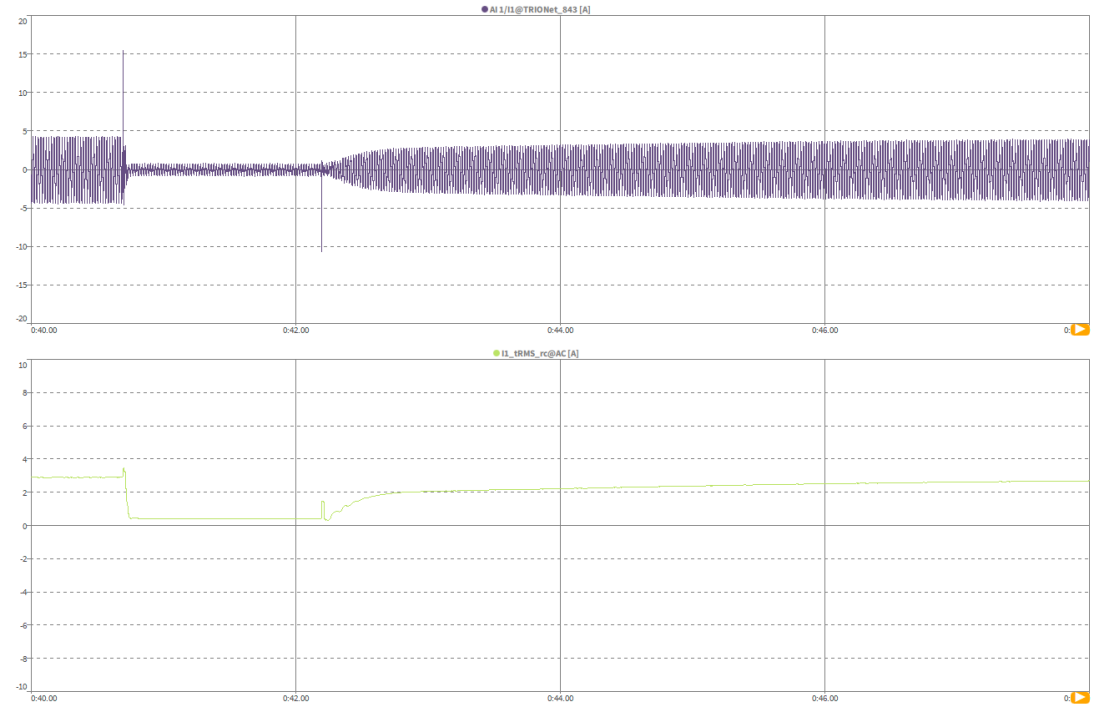
3.2

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3,2
	1	Date	--	--	yyyy.mm.dd	2026/2/10
	2	Time (start of test)	--	--	hh:mm:ss.f	20:52:43
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	40696
	7	Point of fault clearance	Total	--	ms	42196
	8	Fault duration in empty load test	Total	--	ms	1500
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,500
	10		Total (Phase 2)			0,498
	11		Total (Phase 3)			0,497
	12		Positive sequence			0,496
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,997
	15		Phase 3			0,999
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,440
	17	Active power	Total	t1-10s to t1	p.u.	0,306
	18		Pos.			0,306
	19	Reactive power	Total	t1-10s to t1	p.u.	-0,322
	20		Pos.			-0,317
	21	Cosφ	Total	t1-10s to t1	--	0,694
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,500
	23		Phase 2			0,498
	24		Phase 3			0,497
	25	Line current	Phase 1	t1+60ms	p.u.	0,061
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,068
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,020
	32		Pos.			0,020
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			0,999
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,303
	37		Pos.			0,303
	38	Active power rising time	Total	--	s	0,600
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	-0,201
	40		Pos.			-0,194
	41	Reactive power rising time	total	--	s	9,297
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

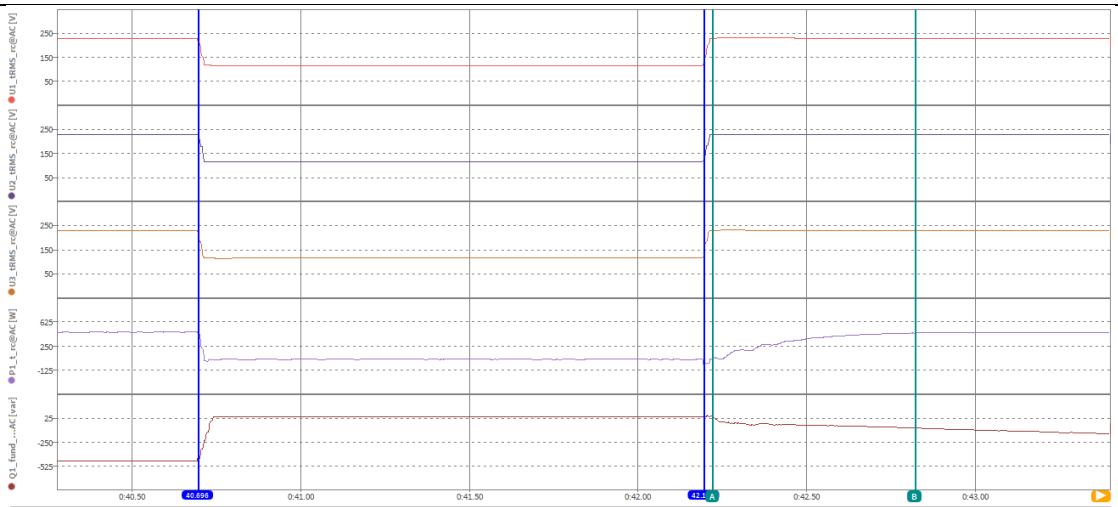
CME06-2BM250



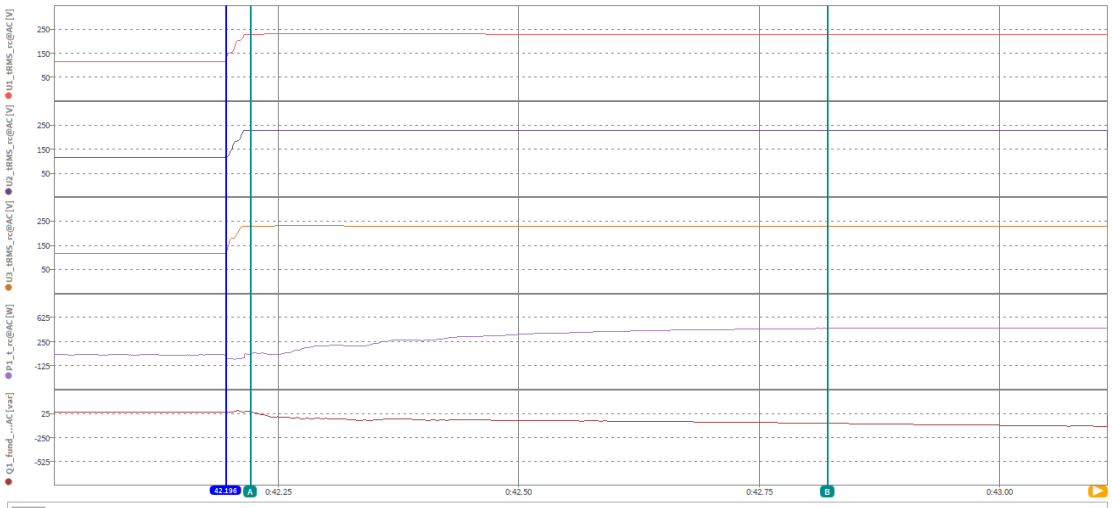


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



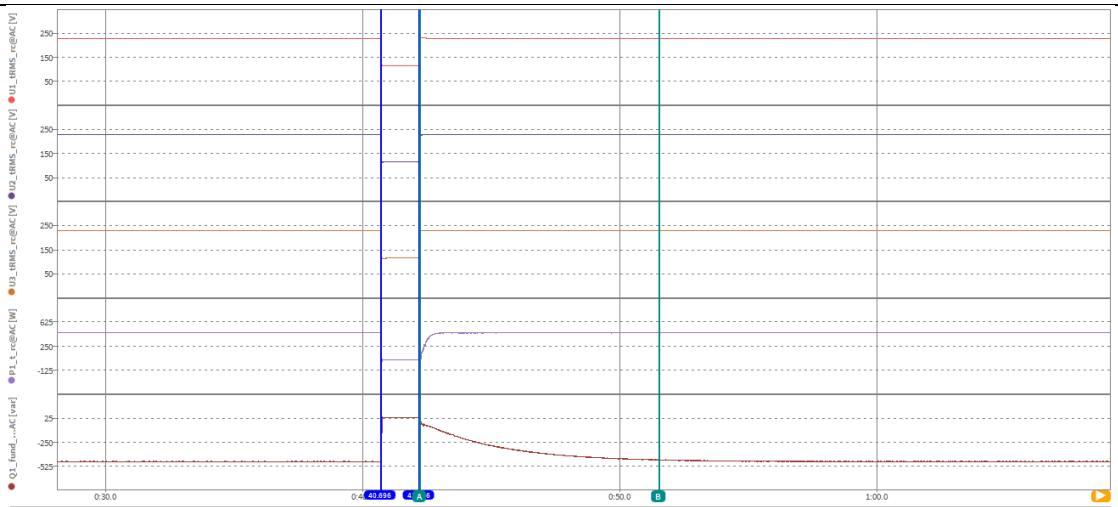
	A	B	Delta
Time [s]	0:42.2219	0:42.8216	0.5997
U1_tRMS_rc@AC [V]	228.4487	230.0954	1.646683
U2_tRMS_rc@AC [V]	228.1907	229.4123	1.221603
U3_tRMS_rc@AC [V]	228.5215	229.5883	1.066803
P1_t_rc@AC [W]	42.16756	444.1614	401.9939
Q1_fund_rc@AC [var]	44.40845	-94.36919	-138.7776



	A	B	Delta
Time [s]	0:42.2219	0:42.8216	0.5997
U1_tRMS_rc@AC [V]	228.4487	230.0954	1.646683
U2_tRMS_rc@AC [V]	228.1907	229.4123	1.221603
U3_tRMS_rc@AC [V]	228.5215	229.5883	1.066803
P1_t_rc@AC [W]	42.16756	444.1614	401.9939
Q1_fund_rc@AC [var]	44.40845	-94.36919	-138.7776

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:42.2219	0:51.5184	9.2965
U1_tRMS_rc@AC [V]	228.4487	230.0986	1.649857
U2_tRMS_rc@AC [V]	228.1907	229.3226	1.131943
U3_tRMS_rc@AC [V]	228.5215	229.6494	1.127808
P1_t_rc@AC [W]	42.16756	459.1712	417.0037
Q1_fund_rc@AC [var]	44.40845	-456.1314	-500.5398

5.8.3	For PGUs Type 2 and storage systems	P

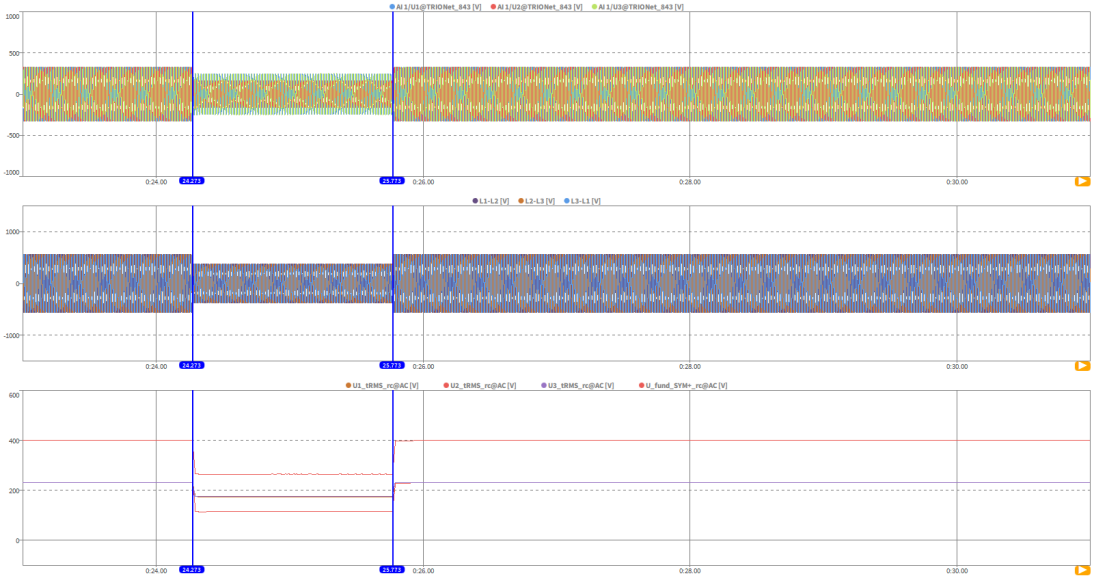
CME06-2BM250

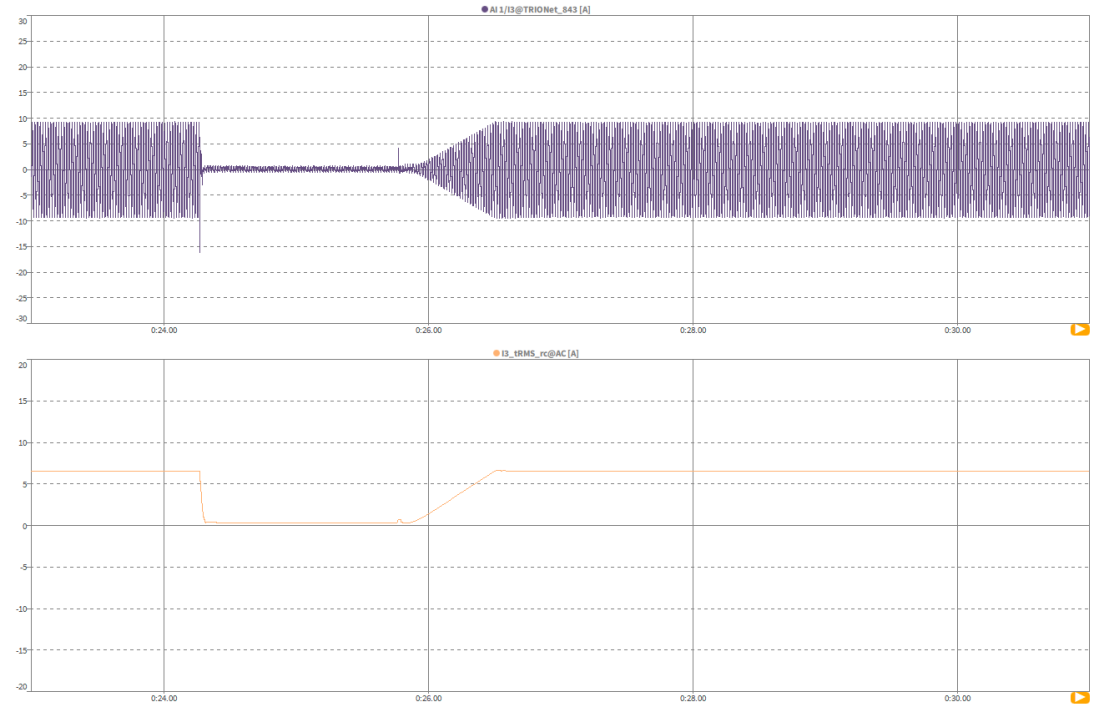
3.3

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3,3
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	13:24:07
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	24273
	7	Point of fault clearance	Total	--	ms	25773
	8	Fault duration in empty load test	Total	--	ms	1500
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,759
	10		Total (Phase 2)			0,499
	11		Total (Phase 3)			0,759
	12		Positive sequence			0,381
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,998
	15		Phase 3			1,001
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,999
	17	Active power	Total	t1-10s to t1	p.u.	0,947
	18		Pos.			0,947
	19	Reactive power	Total	t1-10s to t1	p.u.	-0,318
	20		Pos.			-0,313
	21	Cosφ	Total	t1-10s to t1	--	0,950
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,759
	23		Phase 2			0,499
	24		Phase 3			0,759
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,065
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,039
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,026
	32		Pos.			0,026
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,002
	34		Phase 2			0,998
	35		Phase 3			1,002
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,949
	37		Pos.			0,949
	38	Active power rising time	Total	--	s	0,738
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	-0,269
	40		Pos.			-0,264
	41	Reactive power rising time	total	--	s	9,807
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

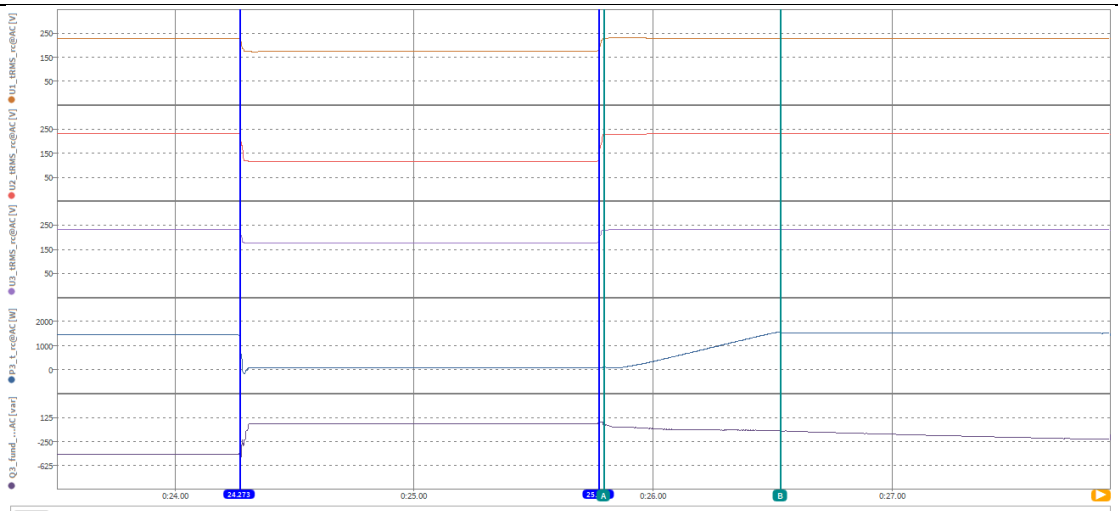
CME06-2BM250



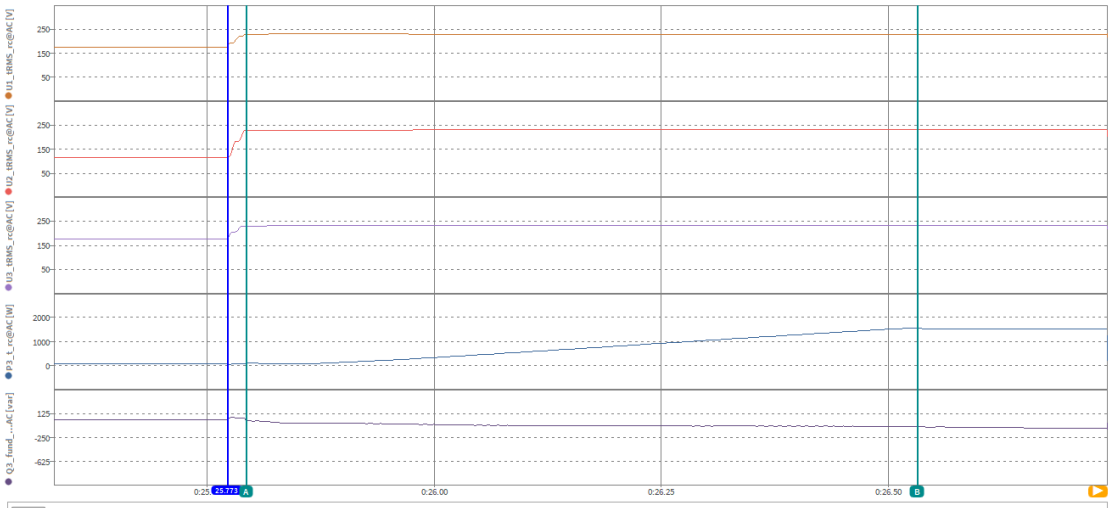


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



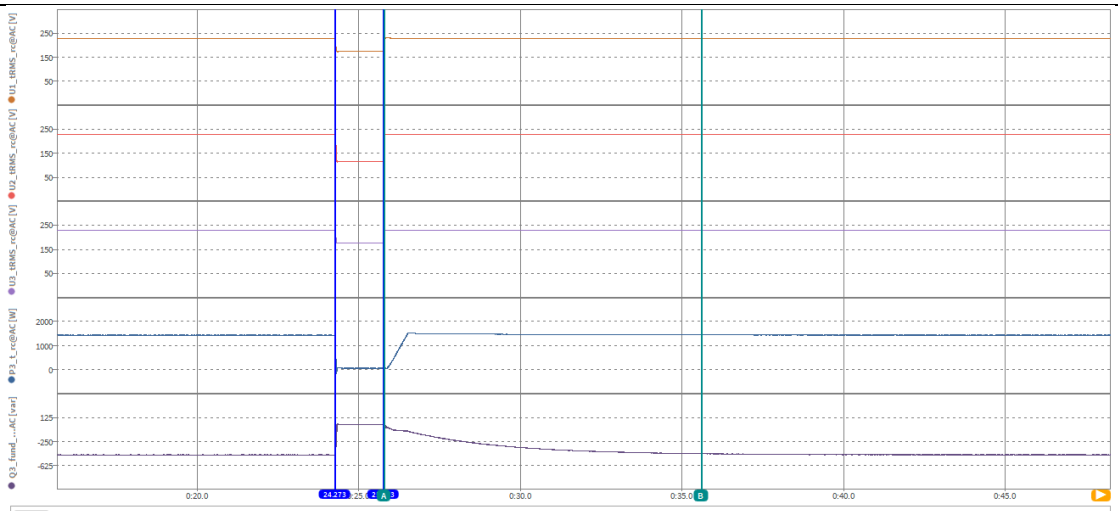
	A	B	Delta
Time [s]	0:25.7940	0:26.5319	0.7379
U1_tRMS_rc@AC [V]	228.0994	230.1797	2.080353
U2_tRMS_rc@AC [V]	228.9287	230.9341	2.005386
U3_tRMS_rc@AC [V]	229.4162	230.8973	1.481094
P3_t_rc@AC [W]	52.19680	1519.687	1467.490
Q3_fund_rc@AC [var]	43.68500	-93.30674	-136.9917



	A	B	Delta
Time [s]	0:25.7940	0:26.5319	0.7379
U1_tRMS_rc@AC [V]	228.0994	230.1797	2.080353
U2_tRMS_rc@AC [V]	228.9287	230.9341	2.005386
U3_tRMS_rc@AC [V]	229.4162	230.8973	1.481094
P3_t_rc@AC [W]	52.19680	1519.687	1467.490
Q3_fund_rc@AC [var]	43.68500	-93.30674	-136.9917

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:25.7940	0:35.6010	9.8069
U1_tRMS_rc@AC [V]	228.0994	230.1249	2.025467
U2_tRMS_rc@AC [V]	228.9287	230.9169	1.988190
U3_tRMS_rc@AC [V]	229.4162	230.8912	1.475006
P3_t_rc@AC [W]	52.19680	1438.682	1386.485
Q3_fund_rc@AC [var]	43.68500	-442.8341	-486.5191

5.8.3	For PGUs Type 2 and storage systems	P

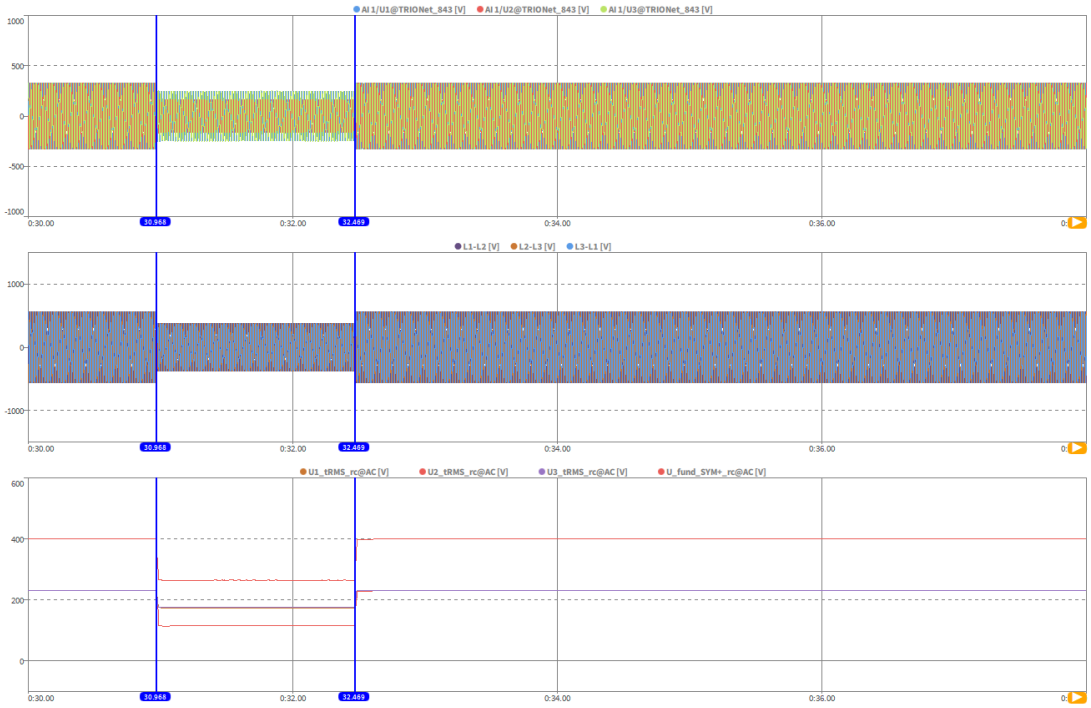
CME06-2BM250

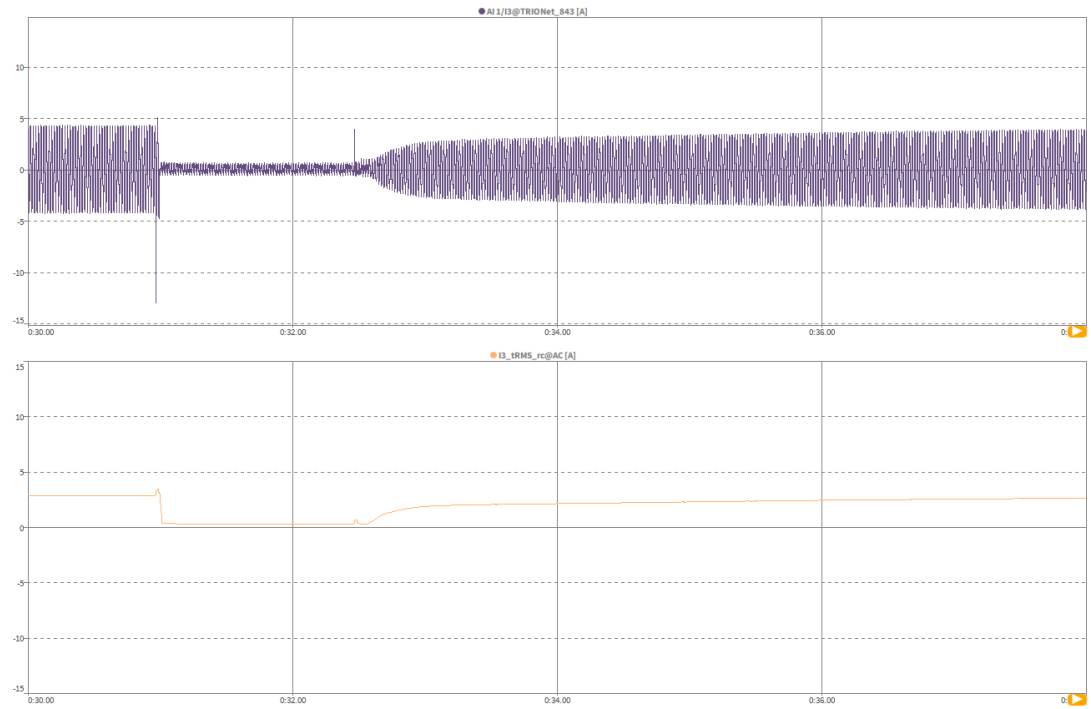
3.4

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3,4
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	13:31:30
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,5
	5	Setting dip duration		--	--	1500
	6	Point of fault entry	Total	--	ms	30968
	7	Point of fault clearance	Total	--	ms	32469
	8	Fault duration in empty load test	Total	--	ms	1501
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,759
	10		Total (Phase 2)			0,499
	11		Total (Phase 3)			0,759
	12		Positive sequence			0,381
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,000
	14		Phase 2			0,998
	15		Phase 3			1,000
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,453
	17	Active power	Total	t1-10s to t1	p.u.	0,305
	18		Pos.			0,305
	19	Reactive power	Total	t1-10s to t1	p.u.	-0,329
	20		Pos.			-0,324
	21	Cosφ	Total	t1-10s to t1	--	0,686
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,759
	23		Phase 2			0,499
	24		Phase 3			0,759
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,067
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,042
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,026
	32		Pos.			0,026
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,999
	35		Phase 3			1,001
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,305
	37		Pos.			0,305
	38	Active power rising time	Total	--	s	0,709
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	-0,277
	40		Pos.			-0,271
	41	Reactive power rising time	total	--	s	9,764
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

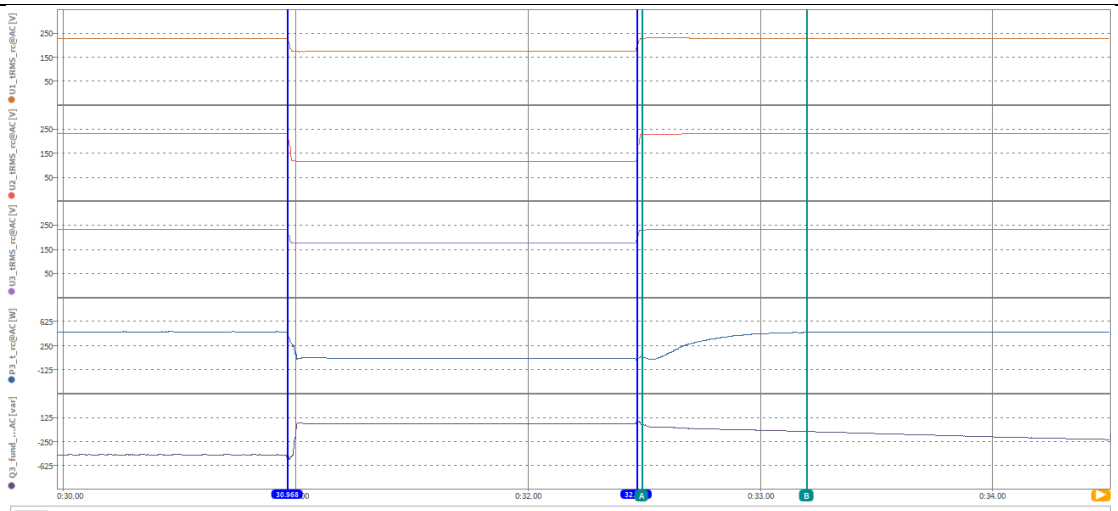
CME06-2BM250



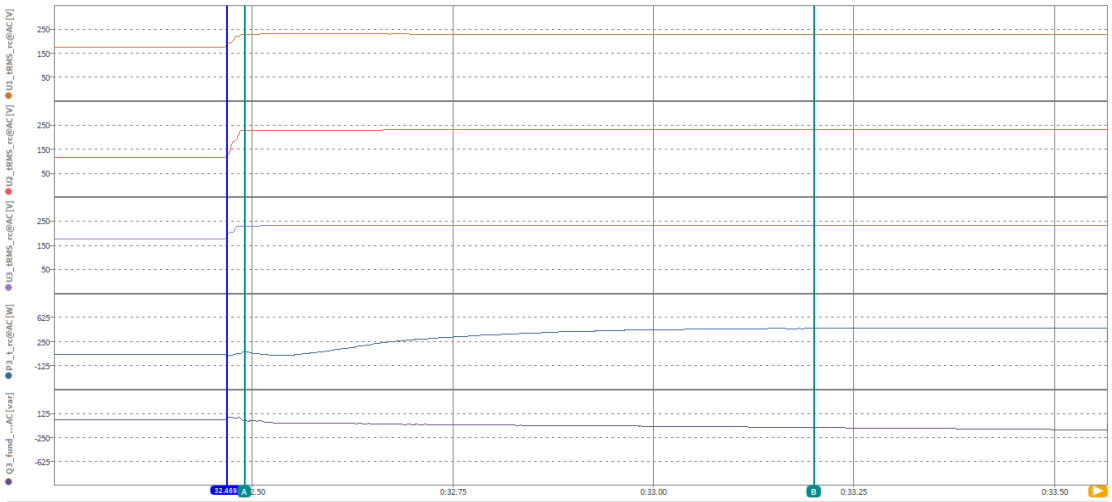


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



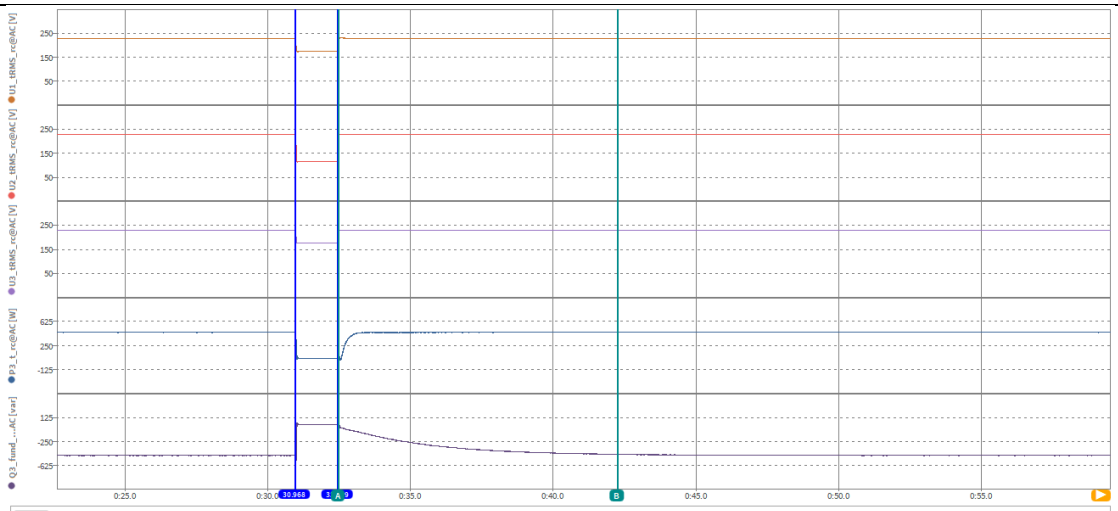
	A	B	Delta
Time [s]	0:32.4916	0:33.2006	0.7090
U1_tRMS_rc@AC [V]	229.3713	230.2464	0.875061
U2_tRMS_rc@AC [V]	229.3387	230.9537	1.615036
U3_tRMS_rc@AC [V]	229.9321	230.8489	0.916870
P3_t_rc@AC [W]	82.33790	445.5500	363.2121
Q3_fund_rc@AC [var]	7.022915	-104.9365	-111.9595



	A	B	Delta
Time [s]	0:32.4916	0:33.2006	0.7090
U1_tRMS_rc@AC [V]	229.3713	230.2464	0.875061
U2_tRMS_rc@AC [V]	229.3387	230.9537	1.615036
U3_tRMS_rc@AC [V]	229.9321	230.8489	0.916870
P3_t_rc@AC [W]	82.33790	445.5500	363.2121
Q3_fund_rc@AC [var]	7.022915	-104.9365	-111.9595

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:32.4918	0:42.2561	9.7644
U1_tRMS_rc@AC [V]	229.3809	230.1366	0.755676
U2_tRMS_rc@AC [V]	229.3429	230.9747	1.631760
U3_tRMS_rc@AC [V]	229.9396	230.8244	0.884766
P3_t_rc@AC [W]	85.14867	456.3401	371.1915
Q3_fund_rc@AC [var]	5.978226	-455.1069	-461.0851

5.8.3	For PGUs Type 2 and storage systems	P

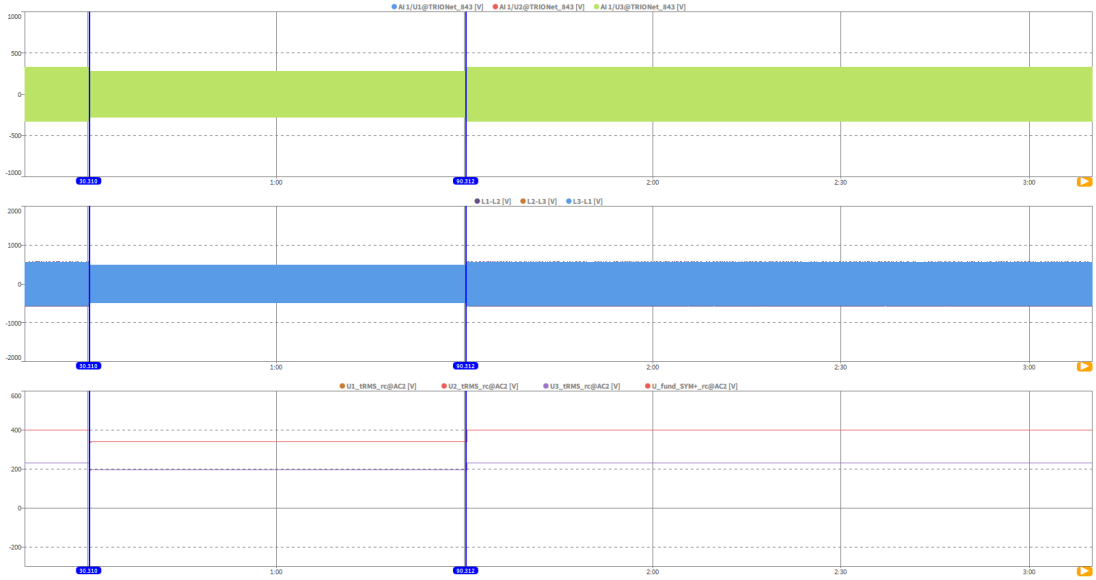
CME06-2BM250

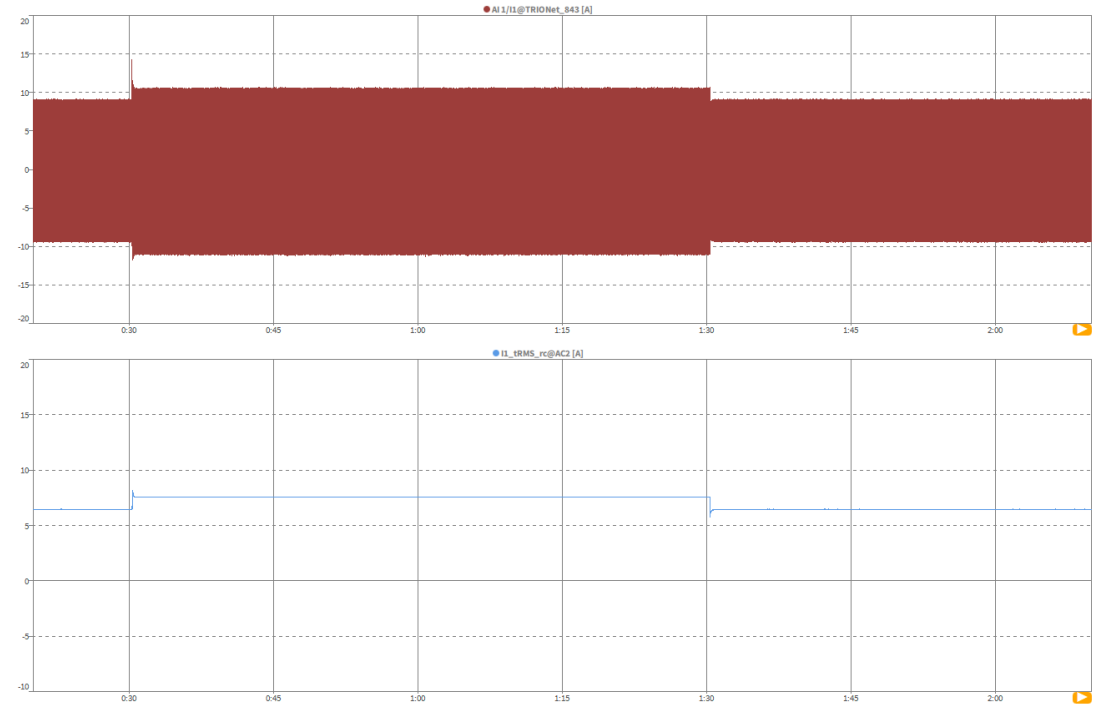
4.1

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4,1
	1	Date	--	--	yyyy.mm.dd	2026/2/9
	2	Time (start of test)	--	--	hh:mm:ss.f	10:39:27
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,85
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	30310
	7	Point of fault clearance	Total	--	ms	90312
	8	Fault duration in empty load test	Total	--	ms	60002
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,855
	10		Total (Phase 2)			0,848
	11		Total (Phase 3)			0,848
	12		Positive sequence			0,847
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,997
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,989
	17	Active power	Total	t1-10s to t1	p.u.	0,991
	18		Pos.			0,991
	19	Reactive power	Total	t1-10s to t1	p.u.	0,023
	20		Pos.			0,005
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,855
	23		Phase 2			0,848
	24		Phase 3			0,848
	25	Line current	Phase 1	t1+60ms	p.u.	1,249
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	1,205
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,990
	32		Pos.			0,990
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,002
	34		Phase 2			0,998
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,991
	37		Pos.			0,991
	38	Active power rising time	Total	--	s	0,623
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,020
	40		Pos.			0,004
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

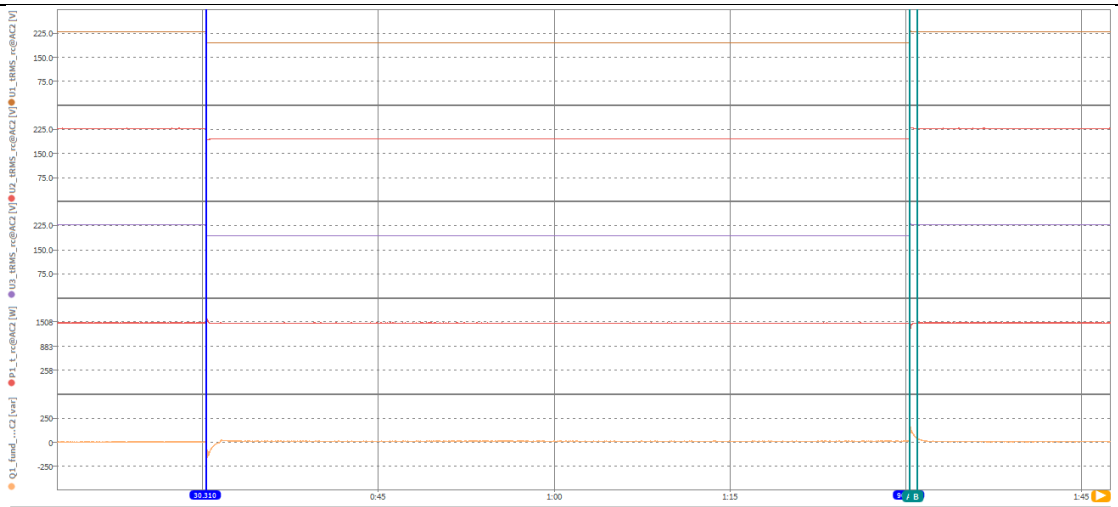
CME06-2BM250



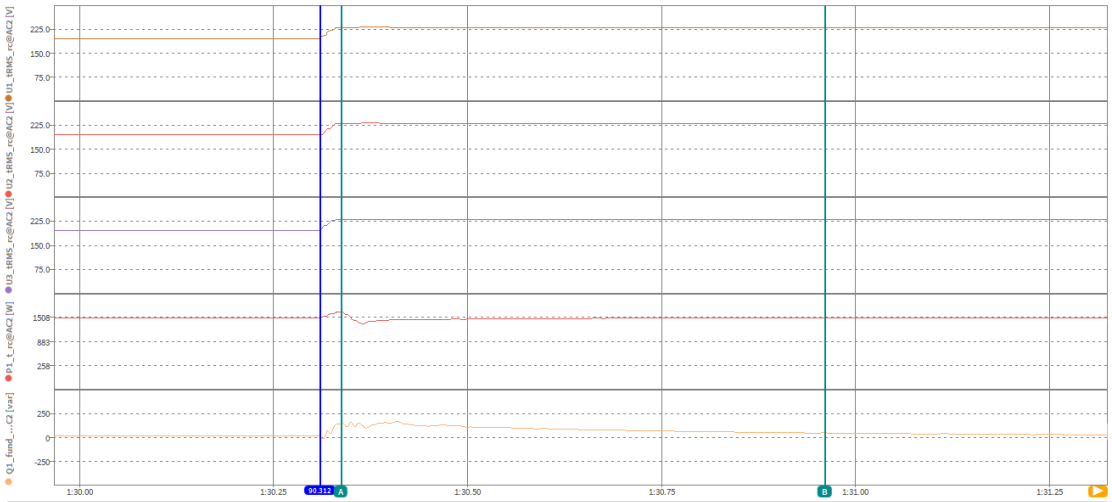


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	1:30.33766	1:30.96076	0.62309
U1_tRMS_rc@AC2 [V]	230.0900	230.4575	0.367462
U2_tRMS_rc@AC2 [V]	229.1376	229.4505	0.312943
U3_tRMS_rc@AC2 [V]	229.2977	229.6561	0.358490
P1_t_rc@AC2 [W]	1646.480	1485.371	-161.1093
Q1_fund_rc@AC2 [var]	137.5703	40.49512	-97.07513



	A	B	Delta
Time [s]	1:30.33766	1:30.96076	0.62309
U1_tRMS_rc@AC2 [V]	230.0900	230.4575	0.367462
U2_tRMS_rc@AC2 [V]	229.1376	229.4505	0.312943
U3_tRMS_rc@AC2 [V]	229.2977	229.6561	0.358490
P1_t_rc@AC2 [W]	1646.480	1485.371	-161.1093
Q1_fund_rc@AC2 [var]	137.5703	40.49512	-97.07513

5.8.3	For PGUs Type 2 and storage systems	P

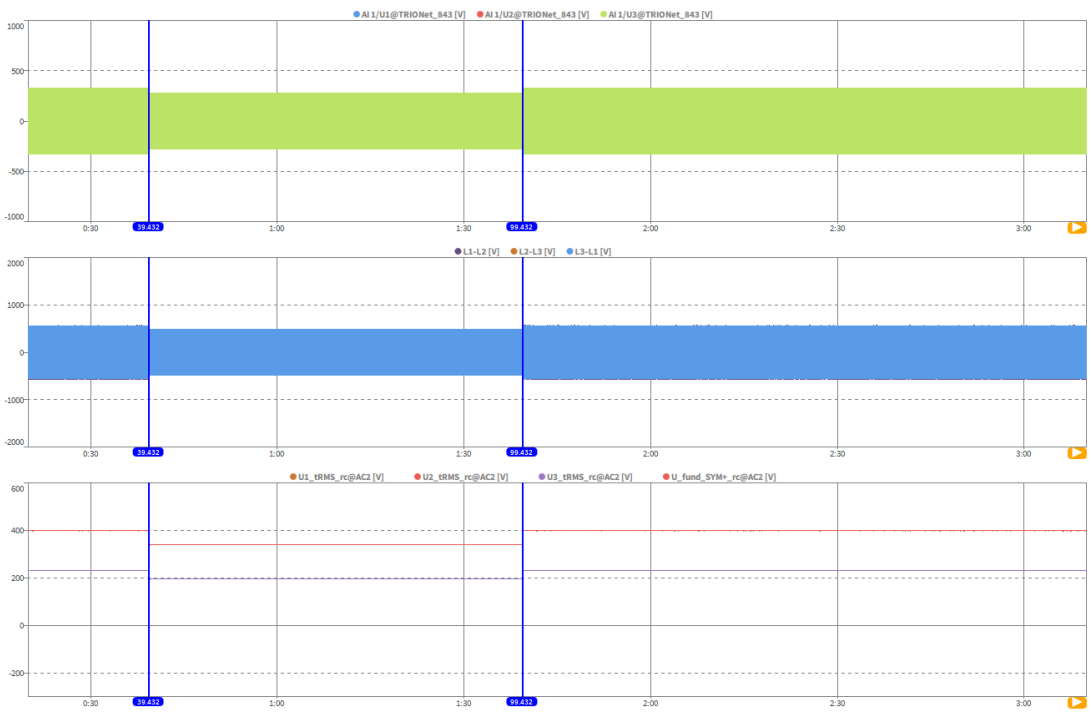
CME06-2BM250

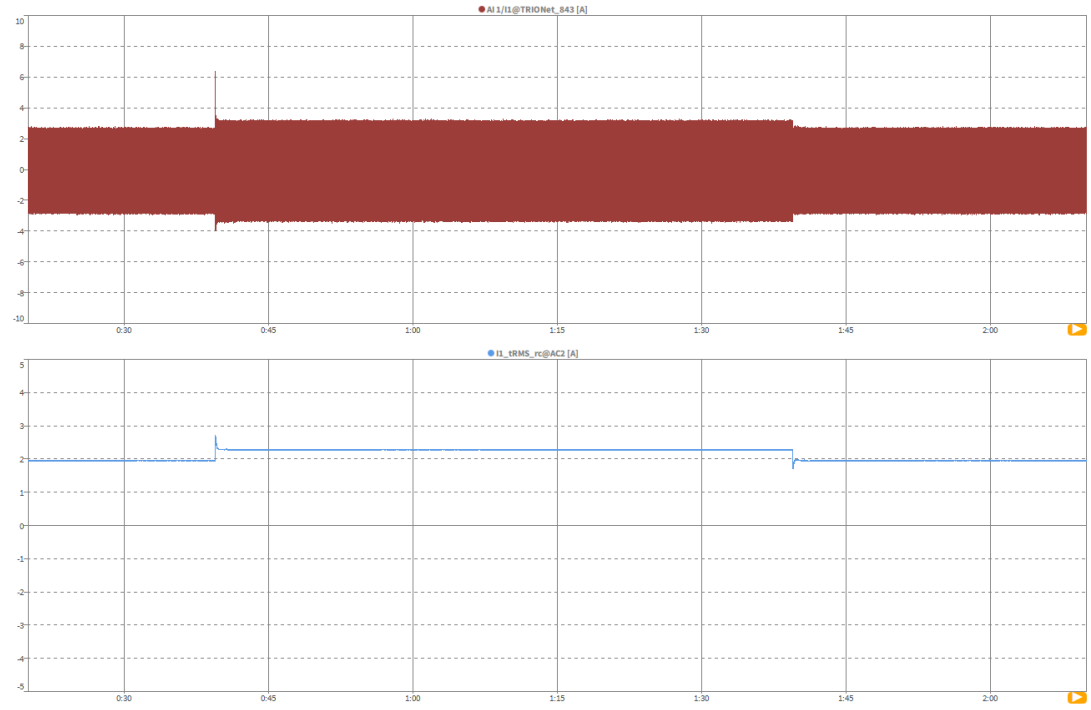
4.2

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4,2
	1	Date	--	--	yyyy.mm.dd	2026/2/9
	2	Time (start of test)	--	--	hh:mm:ss.f	10:44:28
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	0,85
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	39432
	7	Point of fault clearance	Total	--	ms	99432
	8	Fault duration in empty load test	Total	--	ms	60000
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,853
	10		Total (Phase 2)			0,848
	11		Total (Phase 3)			0,848
	12		Positive sequence			0,846
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,998
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,298
	17	Active power	Total	t1-10s to t1	p.u.	0,298
	18		Pos.			0,298
	19	Reactive power	Total	t1-10s to t1	p.u.	0,030
	20		Pos.			0,010
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,853
	23		Phase 2			0,848
	24		Phase 3			0,848
	25	Line current	Phase 1	t1+60ms	p.u.	0,411
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,384
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,297
	32		Pos.			0,297
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,298
	38	Active power rising time	Total	--	s	0,690
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,029
	40		Pos.			0,008
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

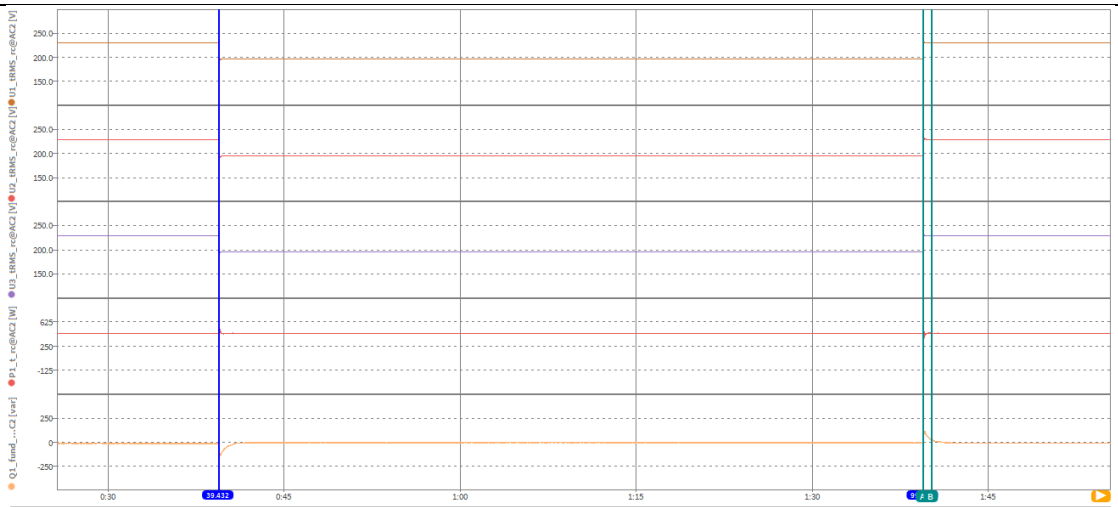
CME06-2BM250



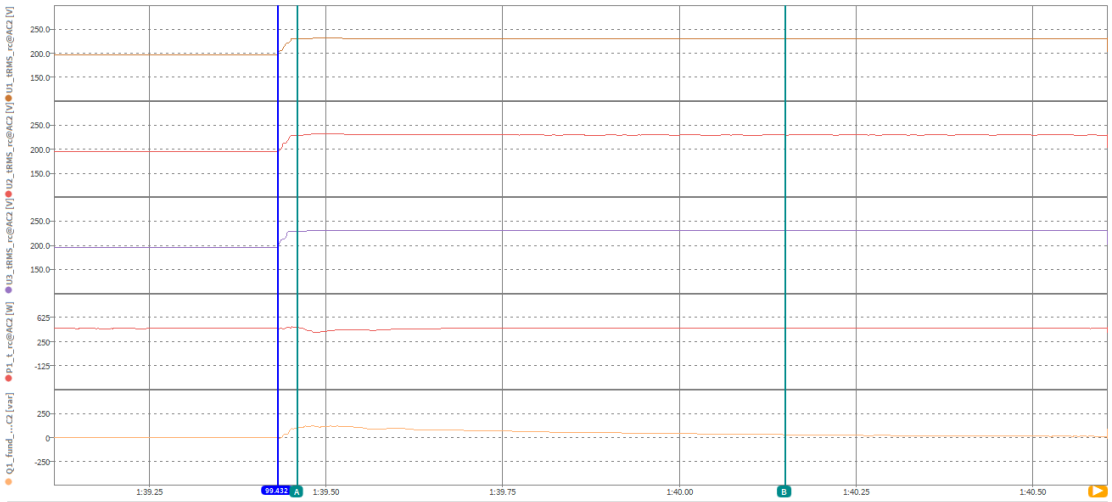


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	1:39.459336	1:40.149191	0.689855
U1_tRMS_rc@AC2 [V]	229.7335	230.2076	0.474106
U2_tRMS_rc@AC2 [V]	229.1177	229.4954	0.377731
U3_tRMS_rc@AC2 [V]	229.3255	229.6275	0.301910
P1_t_rc@AC2 [W]	471.5459	449.4043	-22.14157
Q1_fund_rc@AC2 [var]	89.99364	22.13371	-67.85993



	A	B	Delta
Time [s]	1:39.459336	1:40.149191	0.689855
U1_tRMS_rc@AC2 [V]	229.7335	230.2076	0.474106
U2_tRMS_rc@AC2 [V]	229.1177	229.4954	0.377731
U3_tRMS_rc@AC2 [V]	229.3255	229.6275	0.301910
P1_t_rc@AC2 [W]	471.5459	449.4043	-22.14157
Q1_fund_rc@AC2 [var]	89.99364	22.13371	-67.85993

5.8.3	For PGUs Type 2 and storage systems	P

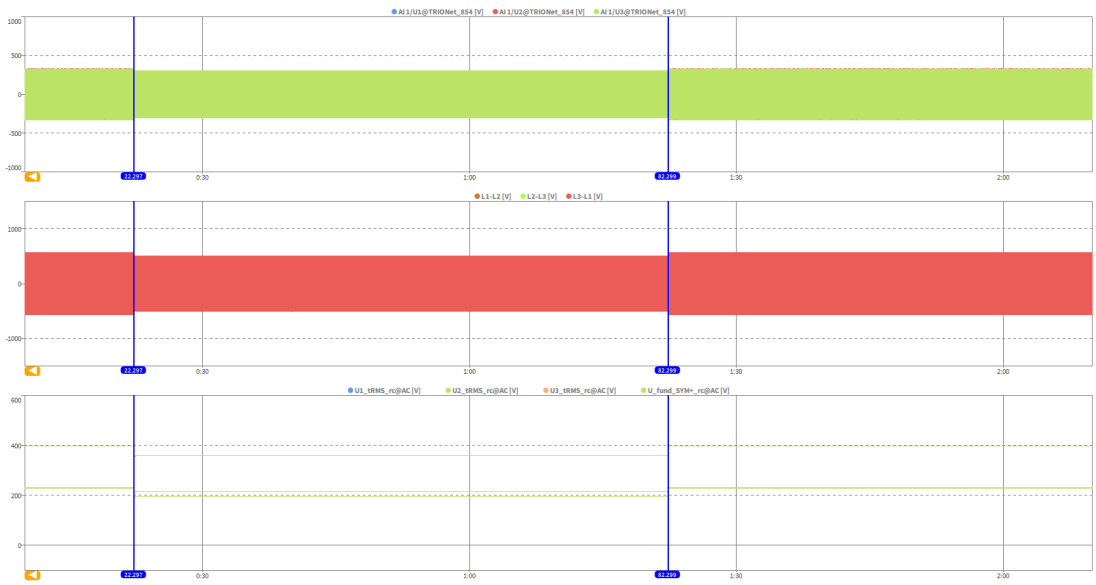
CME06-2BM250

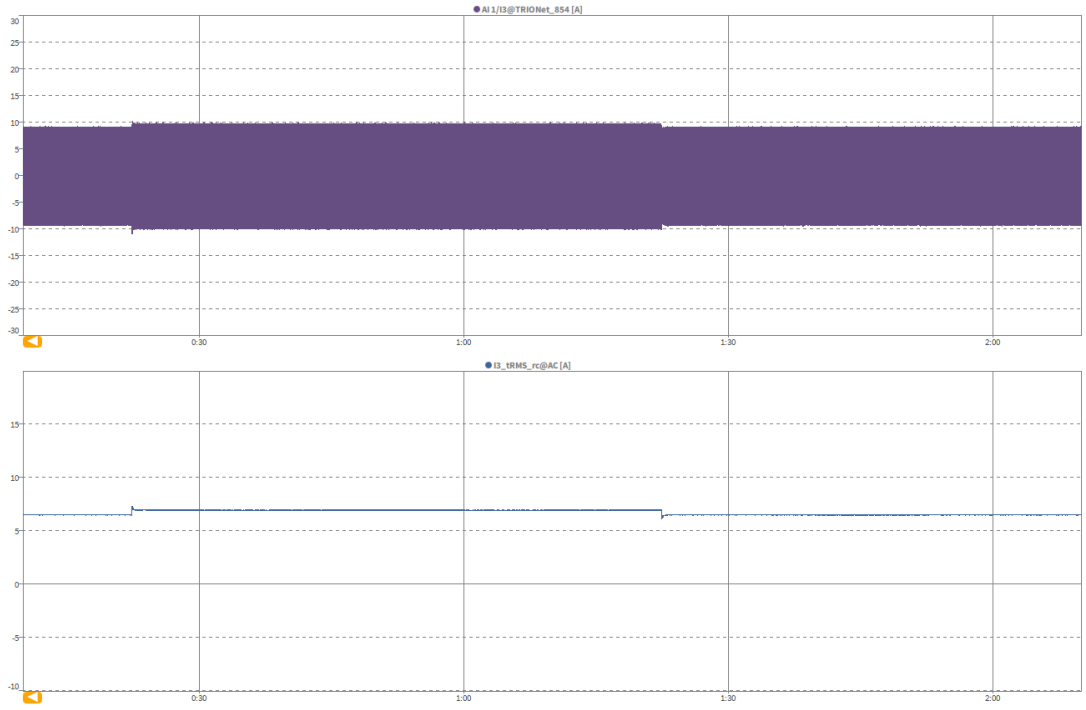
4.3

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4,3
	1	Date	--	--	yyyy.mm.dd	2026/3/19
	2	Time (start of test)	--	--	hh:mm:ss.f	1:27:59
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,85
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	22297
	7	Point of fault clearance	Total	--	ms	82299
	8	Fault duration in empty load test	Total	--	ms	60002
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,929
	10		Total (Phase 2)			0,847
	11		Total (Phase 3)			0,930
	12		Positive sequence			0,897
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,998
	14		Phase 2			0,996
	15		Phase 3			0,999
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,990
	17	Active power	Total	t1-10s to t1	p.u.	0,990
	18		Pos.			0,990
	19	Reactive power	Total	t1-10s to t1	p.u.	0,034
	20		Pos.			0,007
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,929
	23		Phase 2			0,847
	24		Phase 3			0,930
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			1,106
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			1,110
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,985
	32		Pos.			0,985
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,997
	35		Phase 3			1,000
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,989
	37		Pos.			0,989
	38	Active power rising time	Total	--	s	0,236
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,033
	40		Pos.			0,001
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

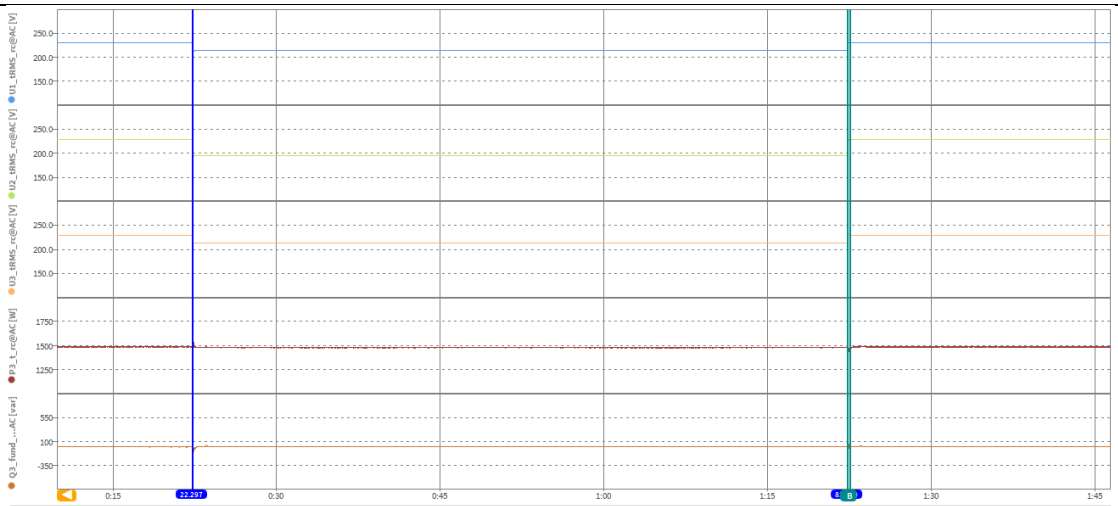
CME06-2BM250



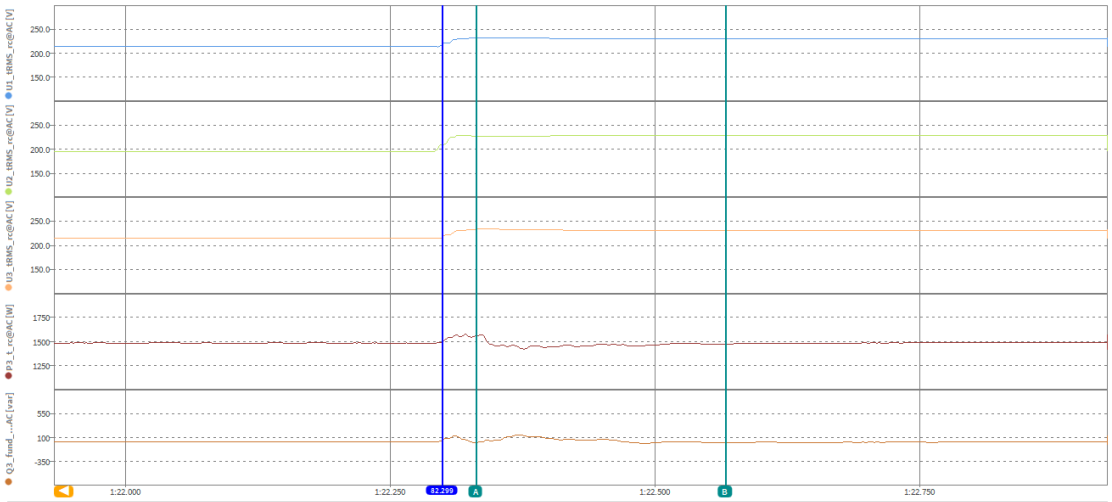


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	1:22.3312	1:22.5669	0.2357
U1_tRMS_rc@AC [V]	232.6046	229.8756	-2.728989
U2_tRMS_rc@AC [V]	227.4177	229.2468	1.829117
U3_tRMS_rc@AC [V]	232.1060	230.0935	-2.012497
P3_t_rc@AC [W]	1546.903	1466.640	-80.26318
Q3_fund_rc@AC [var]	-6.382253	-13.83133	-7.449077



	A	B	Delta
Time [s]	1:22.3312	1:22.5669	0.2357
U1_tRMS_rc@AC [V]	232.6046	229.8756	-2.728989
U2_tRMS_rc@AC [V]	227.4177	229.2468	1.829117
U3_tRMS_rc@AC [V]	232.1060	230.0935	-2.012497
P3_t_rc@AC [W]	1546.903	1466.640	-80.26318
Q3_fund_rc@AC [var]	-6.382253	-13.83133	-7.449077

5.8.3	For PGUs Type 2 and storage systems	P

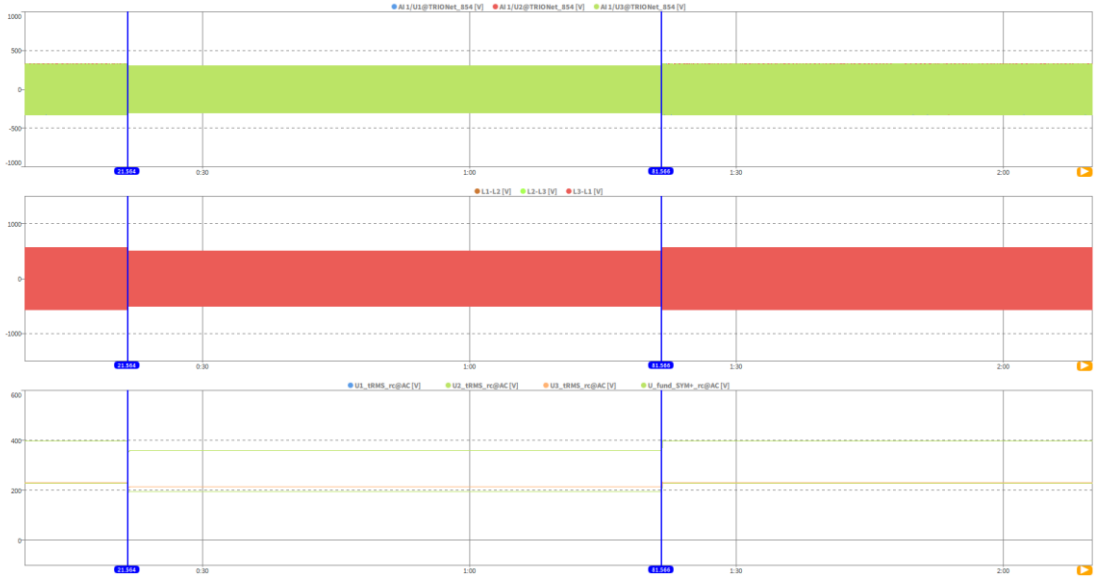
CME06-2BM250

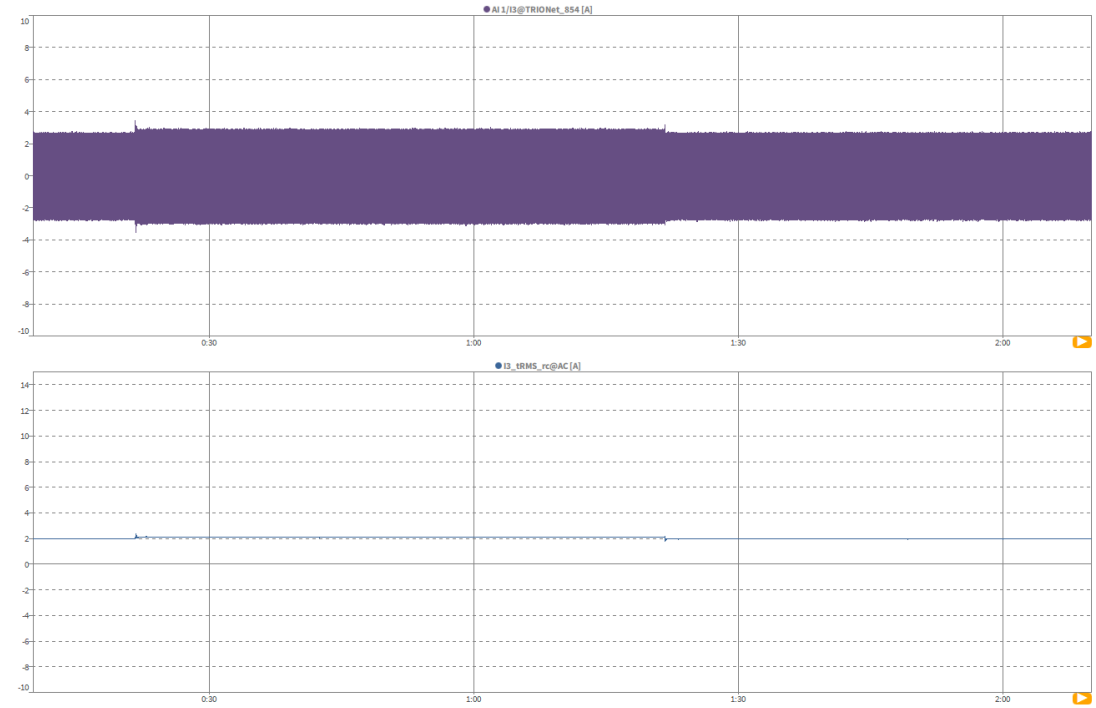
4.4

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4,4
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	10:54:23
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	0,85
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	29506
	7	Point of fault clearance	Total	--	ms	89506
	8	Fault duration in empty load test	Total	--	ms	60000
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	0,929
	10		Total (Phase 2)			0,847
	11		Total (Phase 3)			0,929
	12		Positive sequence			0,897
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,999
	14		Phase 2			0,998
	15		Phase 3			0,999
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,298
	17	Active power	Total	t1-10s to t1	p.u.	0,298
	18		Pos.			0,298
	19	Reactive power	Total	t1-10s to t1	p.u.	0,047
	20		Pos.			0,010
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	0,929
	23		Phase 2			0,847
	24		Phase 3			0,929
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,361
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,347
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,298
	32		Pos.			0,298
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,998
	35		Phase 3			0,999
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,298
	38	Active power rising time	Total	--	s	0,190
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,048
	40		Pos.			0,011
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

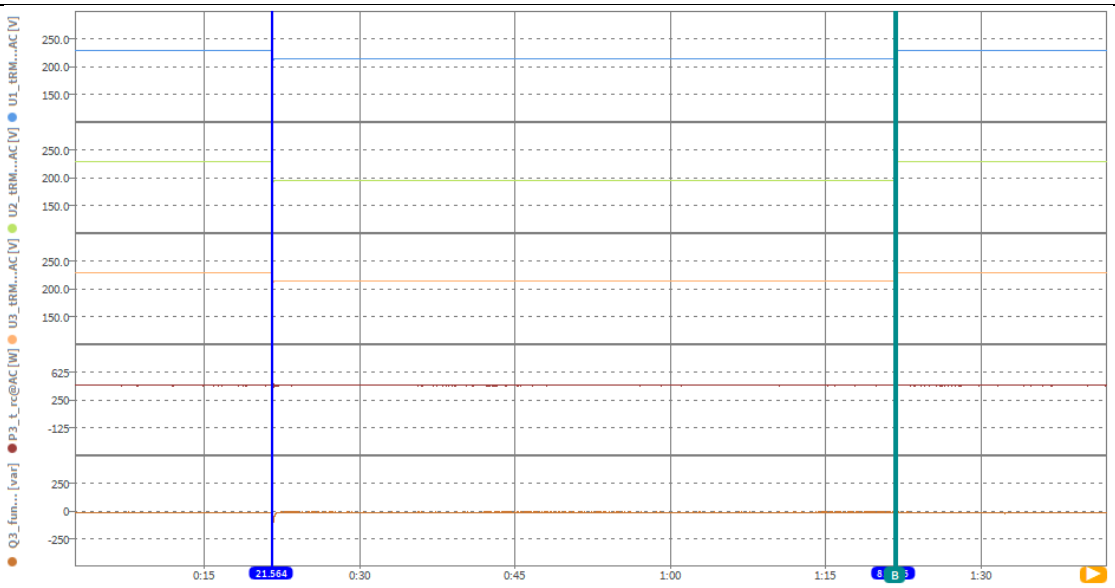
CME06-2BM250



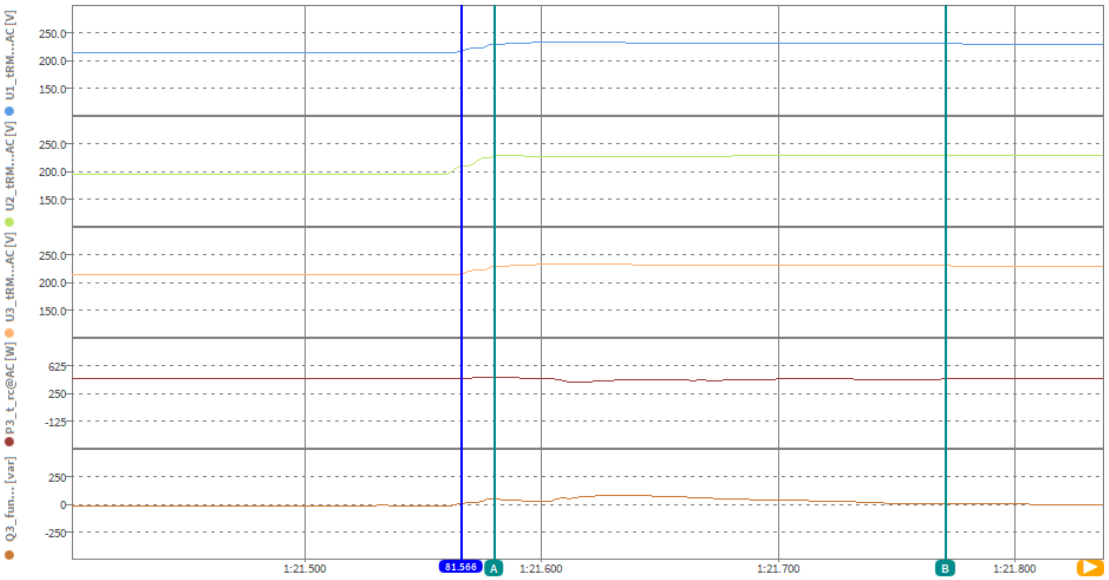


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	间隔
时间 [s]	1:21.580387	1:21.770683	0.190296
U1_tRMS_rc@AC [V]	229.0962	230.1541	1.057922
U2_tRMS_rc@AC [V]	226.2934	229.0945	2.801117
U3_tRMS_rc@AC [V]	228.0403	230.1432	2.102905
P3_t_rc@AC [W]	469.2583	444.3174	-24.94092
Q3_fund_rc@AC [var]	46.85966	3.886349	-42.97331



	A	B	间隔
时间 [s]	1:21.580387	1:21.770683	0.190296
U1_tRMS_rc@AC [V]	229.0962	230.1541	1.057922
U2_tRMS_rc@AC [V]	226.2934	229.0945	2.801117
U3_tRMS_rc@AC [V]	228.0403	230.1432	2.102905
P3_t_rc@AC [W]	469.2583	444.3174	-24.94092
Q3_fund_rc@AC [var]	46.85966	3.886349	-42.97331

5.8.3	For PGUs Type 2 and storage systems	P

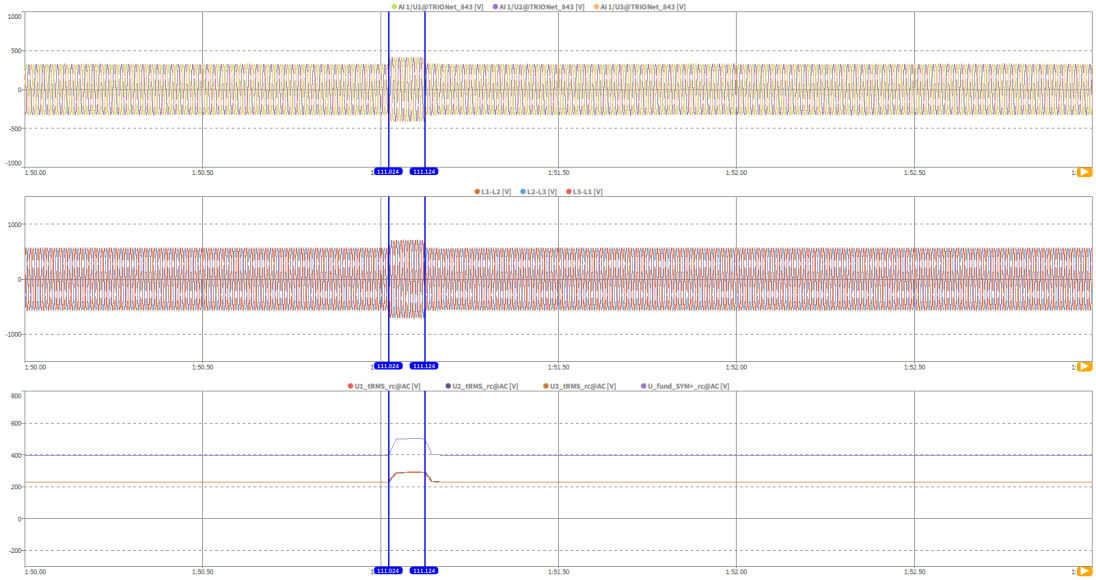
CME06-2BM250

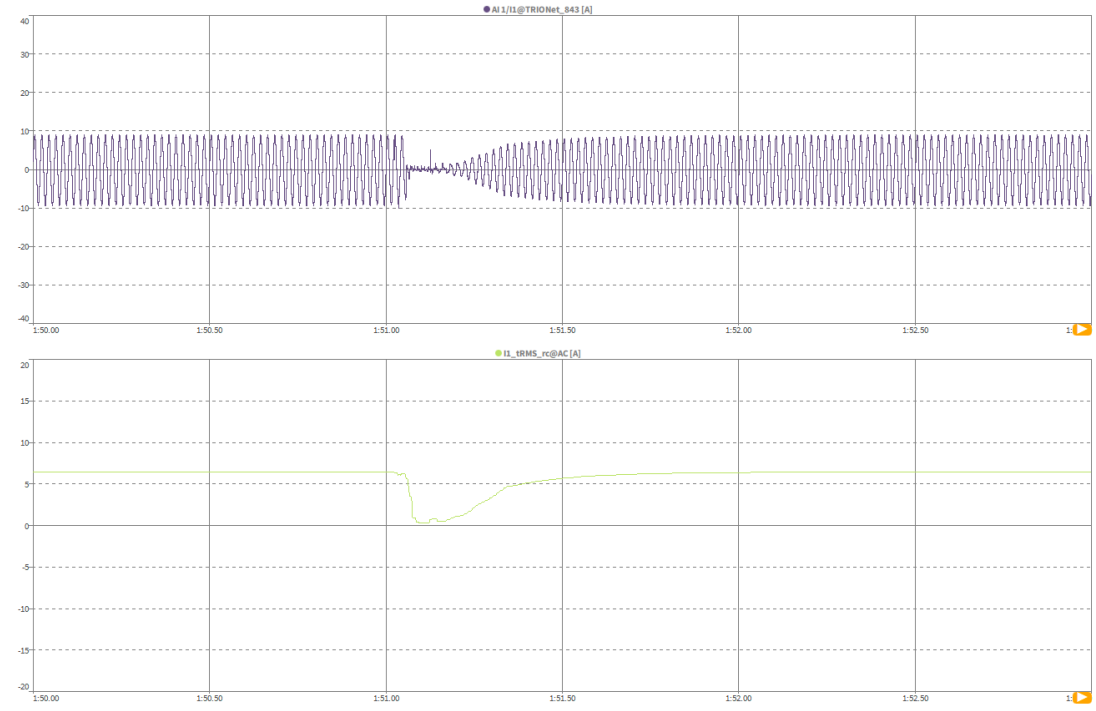
5.1

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5,1
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	9:48:04
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	1,25
	5	Setting dip duration		--	--	100
	6	Point of fault entry	Total	--	ms	111024
	7	Point of fault clearance	Total	--	ms	111124
	8	Fault duration in empty load test	Total	--	ms	100
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,263
	10		Total (Phase 2)			1,258
	11		Total (Phase 3)			1,250
	12		Positive sequence			1,252
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,997
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,988
	17	Active power	Total	t1-10s to t1	p.u.	0,990
	18		Pos.			0,990
	19	Reactive power	Total	t1-10s to t1	p.u.	0,022
	20		Pos.			0,004
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,263
	23		Phase 2			1,258
	24		Phase 3			1,250
	25	Line current	Phase 1	t1+60ms	p.u.	0,132
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,044
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,018
	32		Pos.			0,018
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,997
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,990
	37		Pos.			0,990
	38	Active power rising time	Total	--	s	0,580
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,023
	40		Pos.			0,005
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

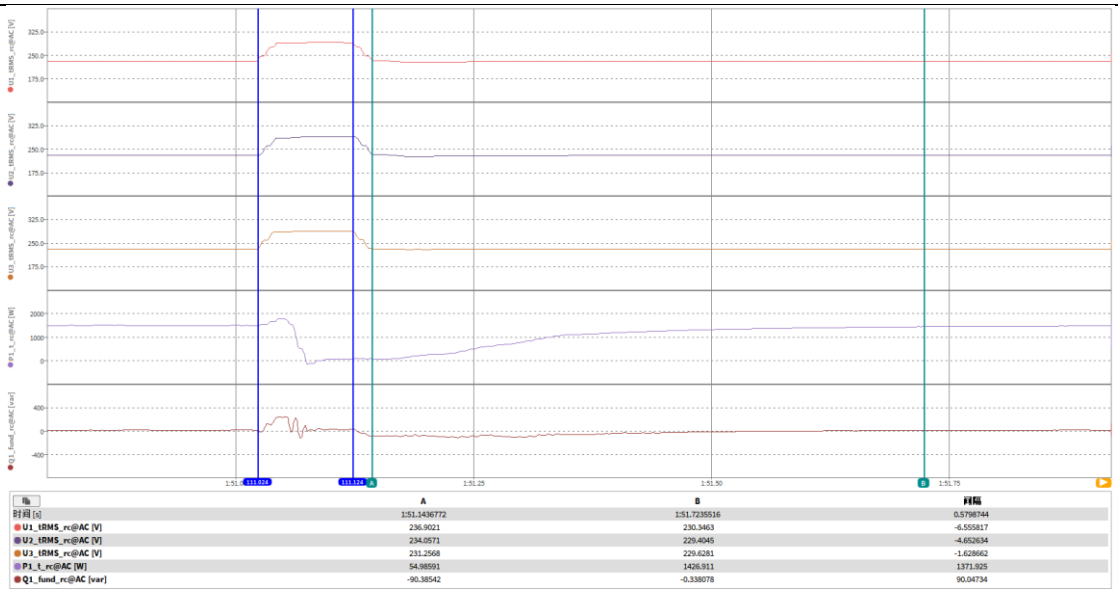
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



5.8.3	For PGUs Type 2 and storage systems	P

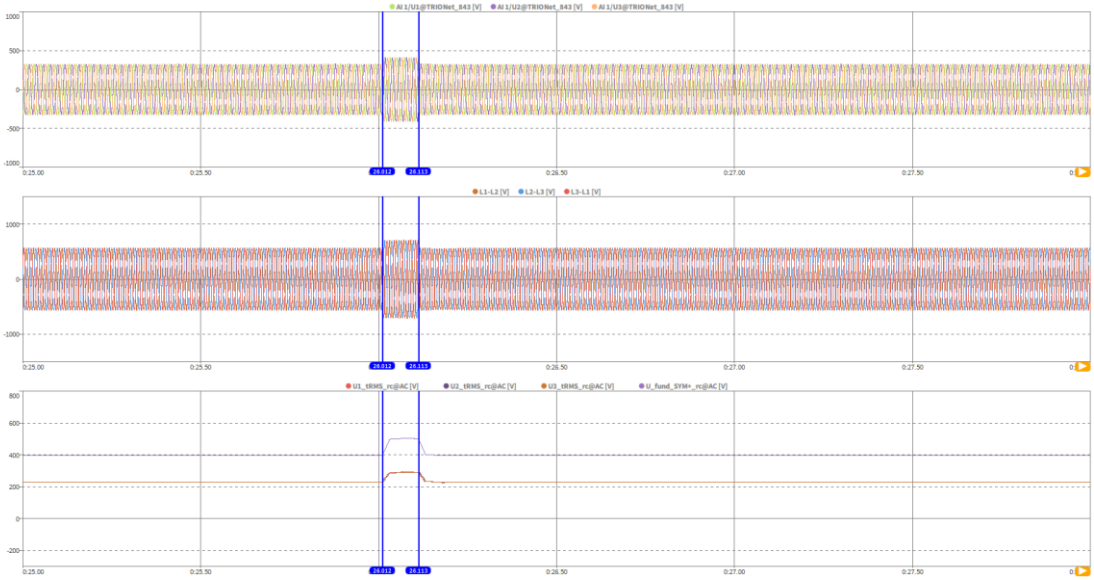
CME06-2BM250

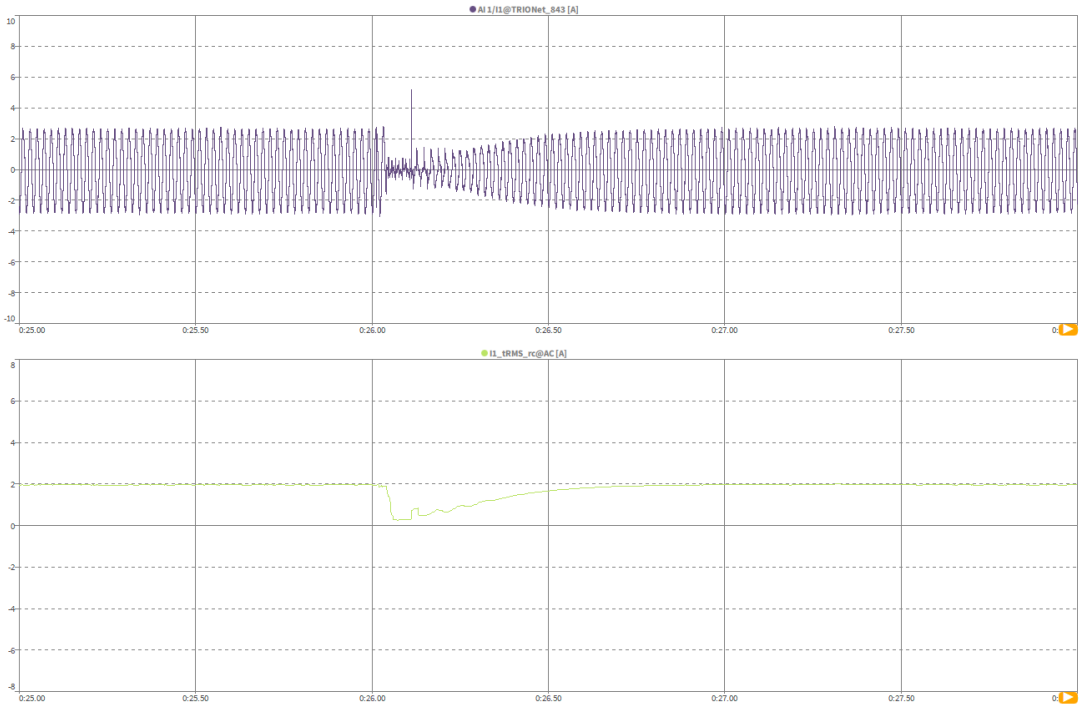
5.2

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5,2
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	9:44:31
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	1,25
	5	Setting dip duration		--	--	100
	6	Point of fault entry	Total	--	ms	26012
	7	Point of fault clearance	Total	--	ms	26113
	8	Fault duration in empty load test	Total	--	ms	101
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,261
	10		Total (Phase 2)			1,258
	11		Total (Phase 3)			1,250
	12		Positive sequence			1,251
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,998
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,299
	17	Active power	Total	t1-10s to t1	p.u.	0,298
	18		Pos.			0,298
	19	Reactive power	Total	t1-10s to t1	p.u.	0,030
	20		Pos.			0,007
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,261
	23		Phase 2			1,258
	24		Phase 3			1,250
	25	Line current	Phase 1	t1+60ms	p.u.	0,126
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,097
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,037
	32		Pos.			0,040
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,298
	38	Active power rising time	Total	--	s	0,746
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,031
	40		Pos.			0,007
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

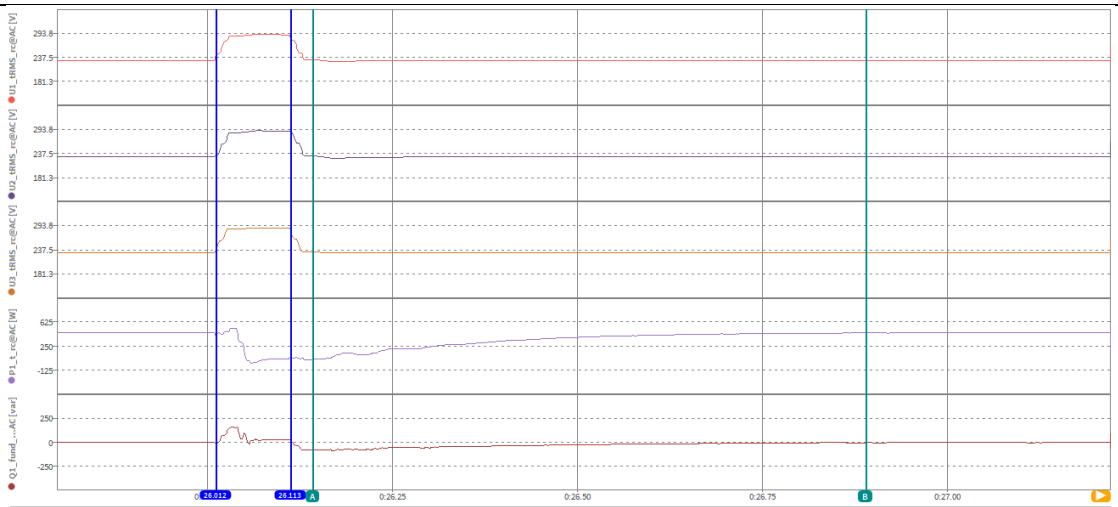
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:26.143151	0:26.889468	0.746318
U1_tRMS_rc@AC [V]	231.8483	230.1887	-1.659592
U2_tRMS_rc@AC [V]	232.0004	229.4569	-2.543518
U3_tRMS_rc@AC [V]	230.6707	229.6314	-1.039276
P1_t_rc@AC [W]	23.24778	446.3419	423.0941
Q1_fund_rc@AC [var]	-90.74420	-13.95117	76.79303

5.8.3	For PGUs Type 2 and storage systems	P

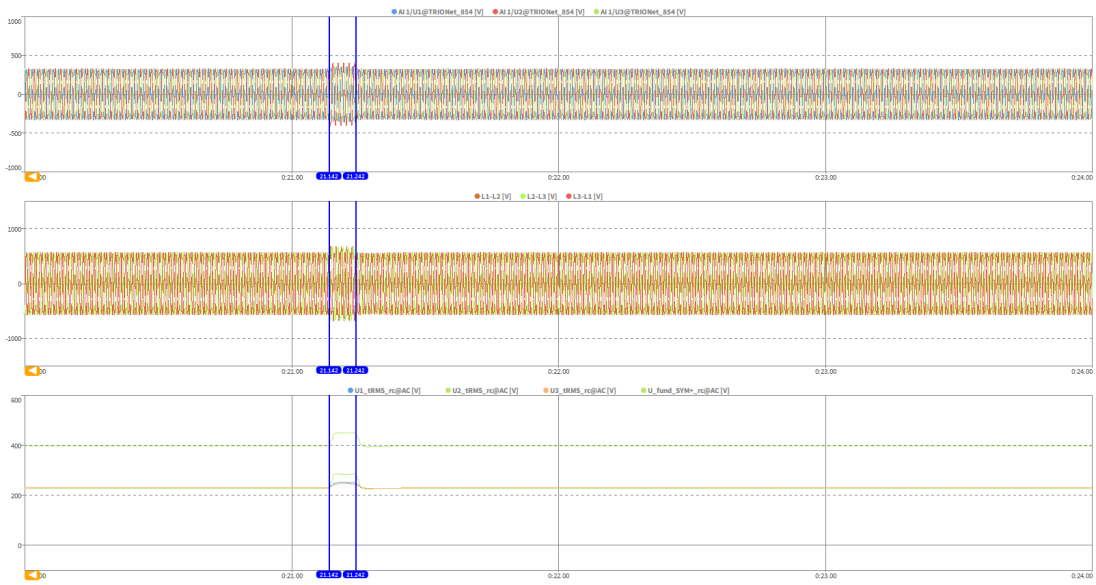
CME06-2BM250

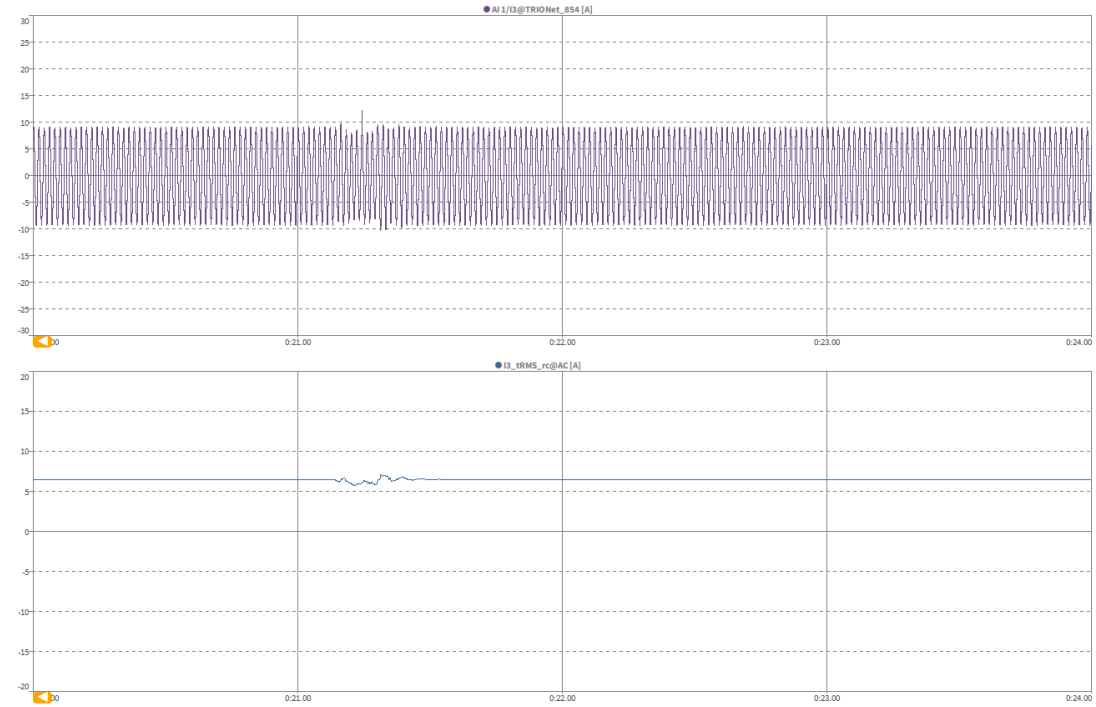
5.3

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5,3
	1	Date	--	--	yyyy.mm.dd	2026/3/19
	2	Time (start of test)	--	--	hh:mm:ss.f	1:28:58
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	1,25
	5	Setting dip duration		--	--	100
	6	Point of fault entry	Total	--	ms	21142
	7	Point of fault clearance	Total	--	ms	21242
	8	Fault duration in empty load test	Total	--	ms	100
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,087
	10		Total (Phase 2)			1,239
	11		Total (Phase 3)			1,067
	12		Positive sequence			1,122
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,999
	14		Phase 2			0,997
	15		Phase 3			1,000
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	1,001
	17	Active power	Total	t1-10s to t1	p.u.	0,989
	18		Pos.			0,989
	19	Reactive power	Total	t1-10s to t1	p.u.	0,034
	20		Pos.			0,002
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,087
	23		Phase 2			1,239
	24		Phase 3			1,067
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,919
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,912
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,971
	32		Pos.			0,971
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,997
	35		Phase 3			1,000
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,988
	37		Pos.			0,988
	38	Active power rising time	Total	--	s	0,181
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,033
	40		Pos.			0,001
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

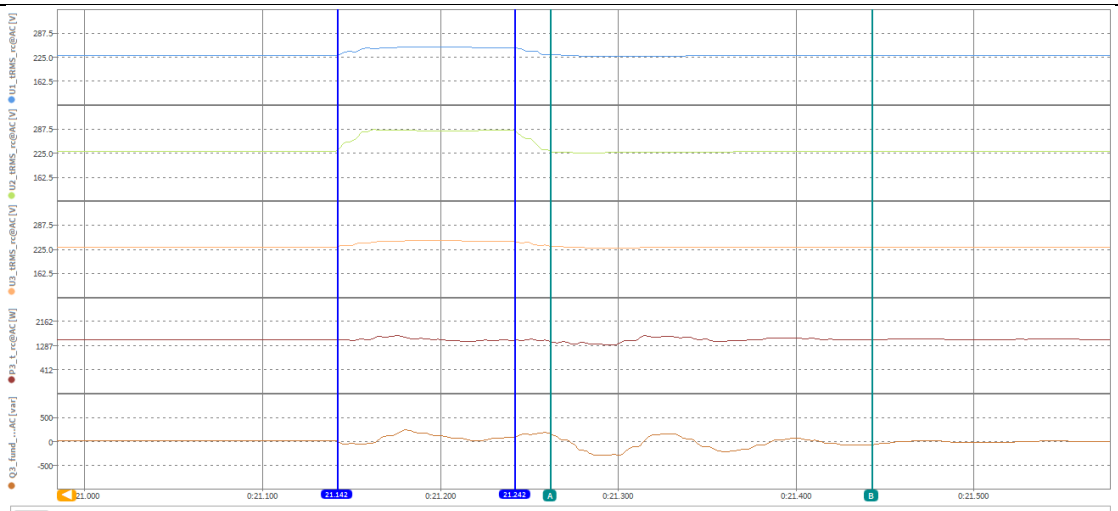
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:21.261847	0:21.442444	0.180597
U1_tRMS_rc@AC [V]	231.5170	229.4235	-2.093491
U2_tRMS_rc@AC [V]	232.0451	229.0341	-3.011032
U3_tRMS_rc@AC [V]	233.8601	229.6765	-4.183578
P3_t_rc@AC [W]	1446.837	1476.286	29.44836
Q3_fund_rc@AC [var]	169.2410	-88.11356	-257.3545

5.8.3	For PGUs Type 2 and storage systems	P

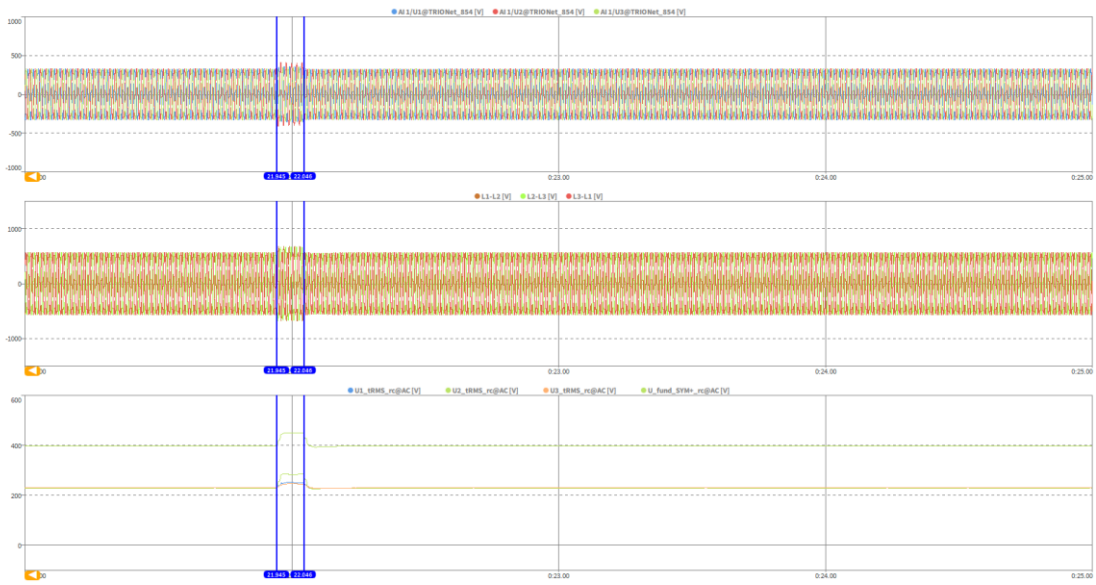
CME06-2BM250

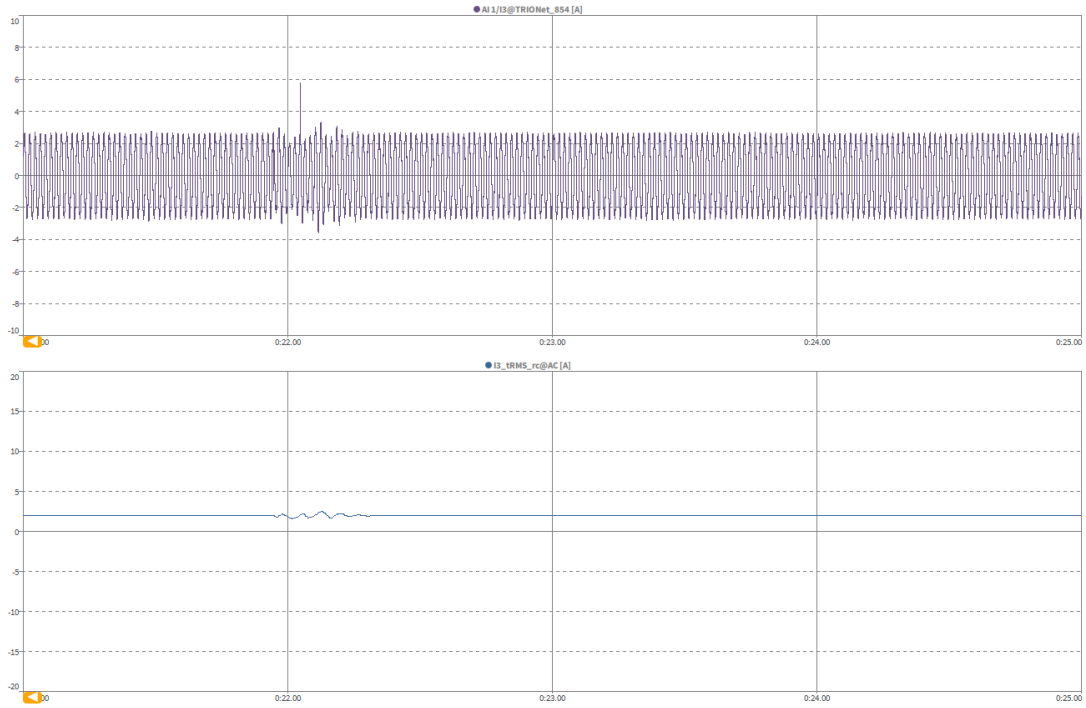
5.4

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5,4
	1	Date	--	--	yyyy.mm.dd	2026/3/19
	2	Time (start of test)	--	--	hh:mm:ss.f	1:30:52
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	1,25
	5	Setting dip duration		--	--	100
	6	Point of fault entry	Total	--	ms	21945
	7	Point of fault clearance	Total	--	ms	22046
	8	Fault duration in empty load test	Total	--	ms	101
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,086
	10		Total (Phase 2)			1,239
	11		Total (Phase 3)			1,066
	12		Positive sequence			1,122
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,999
	14		Phase 2			0,997
	15		Phase 3			0,999
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,301
	17	Active power	Total	t1-10s to t1	p.u.	0,298
	18		Pos.			0,298
	19	Reactive power	Total	t1-10s to t1	p.u.	0,048
	20		Pos.			0,011
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,062
	23		Phase 2			1,259
	24		Phase 3			1,062
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,268
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,285
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,298
	32		Pos.			0,298
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,998
	35		Phase 3			0,999
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,298
	38	Active power rising time	Total	--	s	0,186
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,048
	40		Pos.			0,011
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

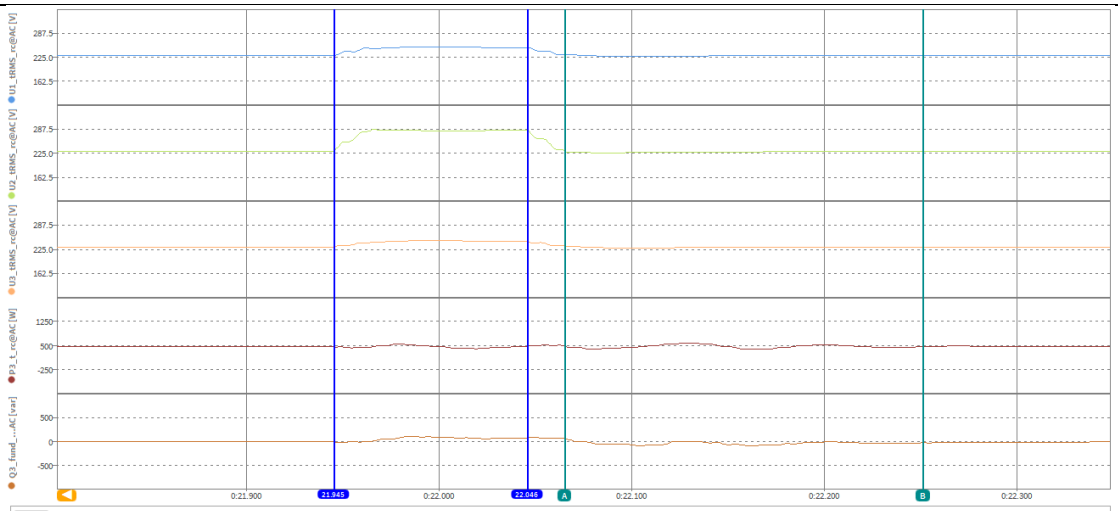
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:22.065282	0:22.251235	0.185954
U1_tRMS_rc@AC [V]	231.6751	229.4313	-2.243835
U2_tRMS_rc@AC [V]	231.0620	229.0884	-1.973572
U3_tRMS_rc@AC [V]	233.1802	229.5580	-3.622238
P3_t_rc@AC [W]	474.5545	434.1933	-40.36127
Q3_fund_rc@AC [var]	51.40622	-42.49780	-93.90401

5.8.3	For PGUs Type 2 and storage systems	P

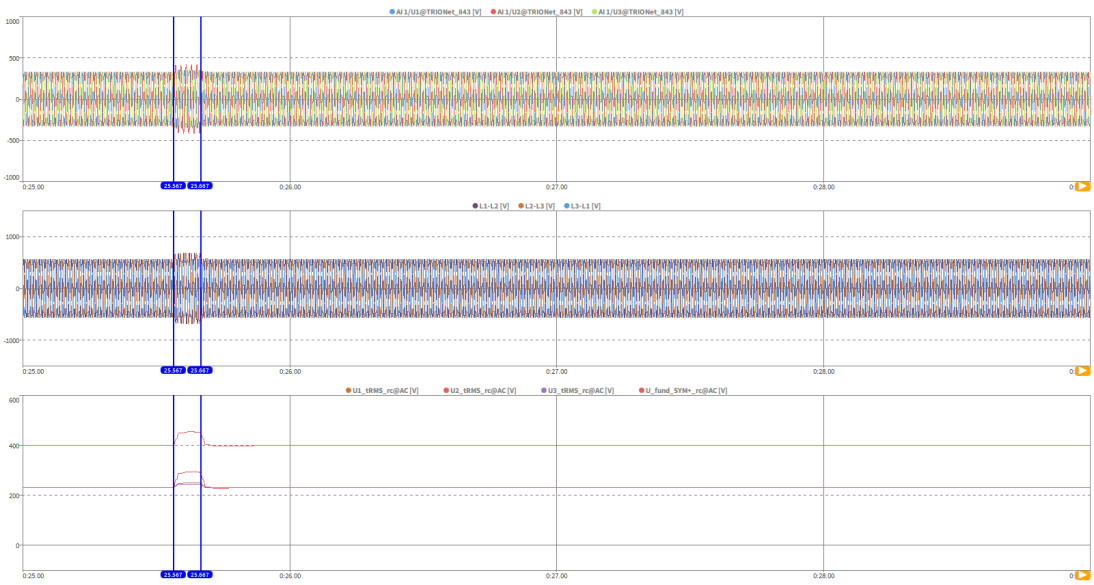
CME06-2BM250

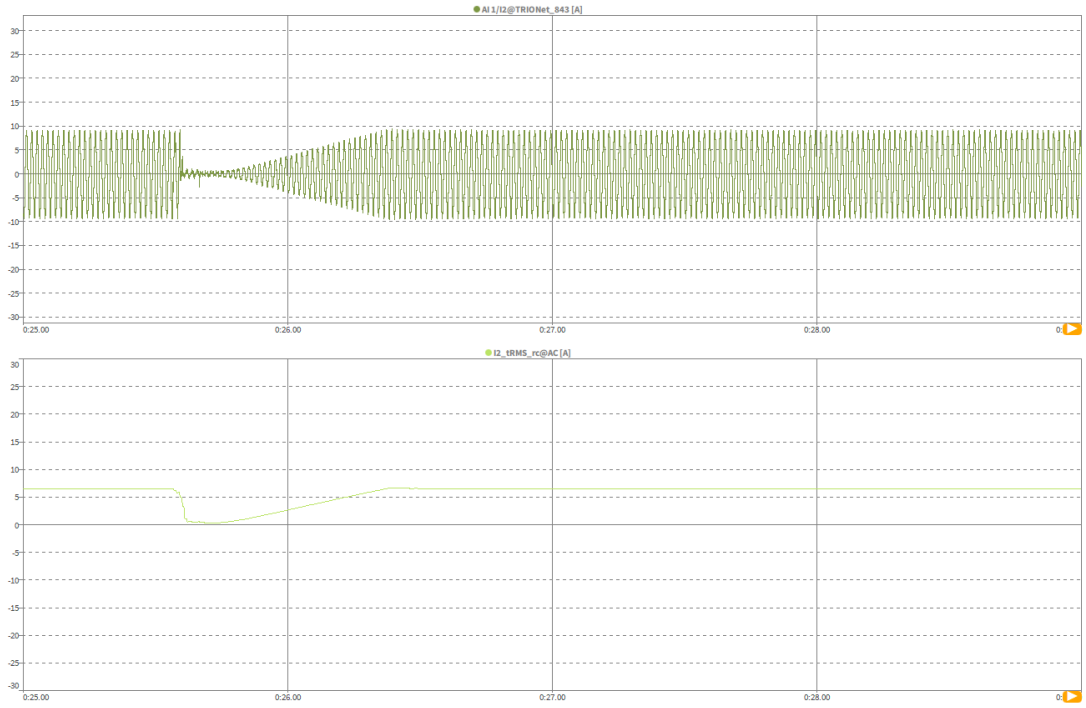
5.5

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5,5
	1	Date	--	--	yyyy.mm.dd	2026/3/3
	2	Time (start of test)	--	--	hh:mm:ss.f	15:17:10
	3	Fault type (phase)	--	--	--	D2
	4	Setting voltage depth	Line to line	--	p.u.	1,25
	5	Setting dip duration		--	--	100
	6	Point of fault entry	Total	--	ms	25567
	7	Point of fault clearance	Total	--	ms	25667
	8	Fault duration in empty load test	Total	--	ms	100
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,078
	10		Total (Phase 2)			1,267
	11		Total (Phase 3)			1,070
	12		Positive sequence			1,130
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			1,006
	15		Phase 3			1,002
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	1,000
	17	Active power	Total	t1-10s to t1	p.u.	0,998
	18		Pos.			0,998
	19	Reactive power	Total	t1-10s to t1	p.u.	0,019
	20		Pos.			0,001
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,078
	23		Phase 2			1,267
	24		Phase 3			1,070
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			0,083
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			0,068
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,013
	32		Pos.			0,014
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			1,006
	35		Phase 3			1,002
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,998
	37		Pos.			0,998
	38	Active power rising time	Total	--	s	0,688
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,019
	40		Pos.			0,001
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

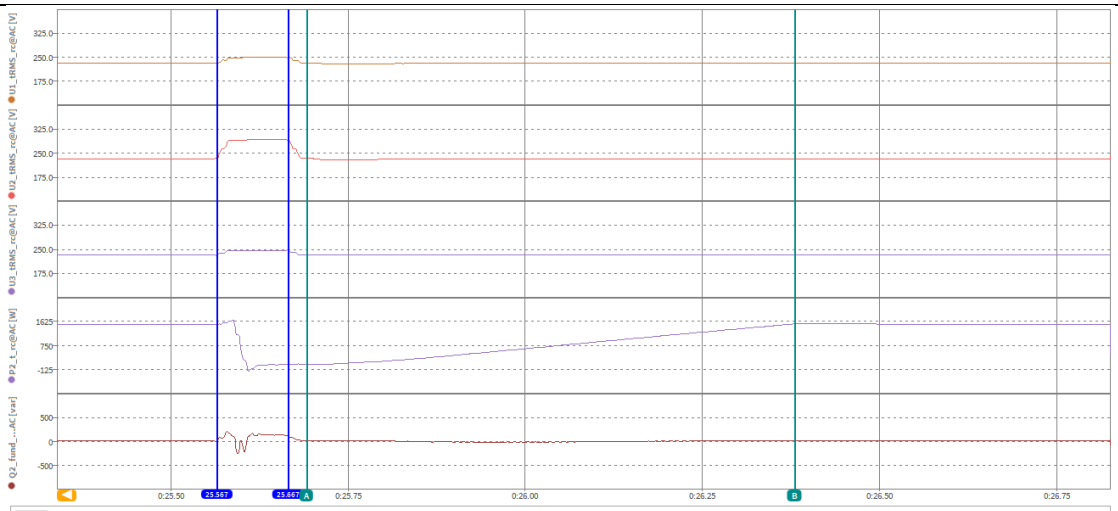
CME06-2BM250





5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:25.69256	0:26.38027	0.68771
U1_tRMS_rc@AC [V]	231.2644	230.1544	-1.110016
U2_tRMS_rc@AC [V]	234.0480	231.3173	-2.730667
U3_tRMS_rc@AC [V]	231.0546	230.3551	-0.699493
P2_t_rc@AC [W]	28.71991	1519.496	1490.776
Q2_fund_rc@AC [var]	1.485349	3.214200	1.728850

5.8.3	For PGUs Type 2 and storage systems	P

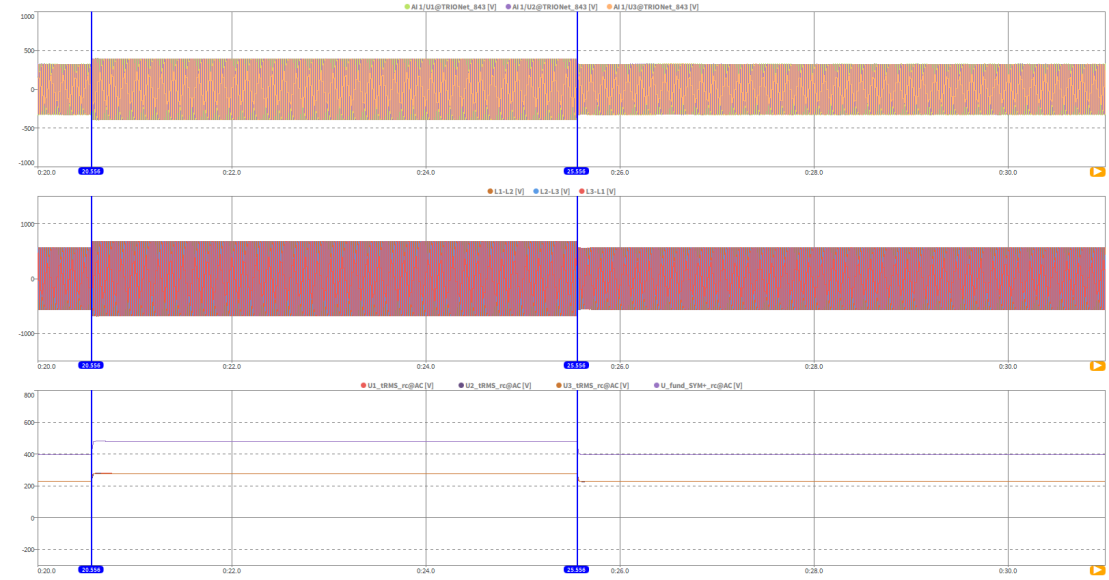
CME06-2BM250

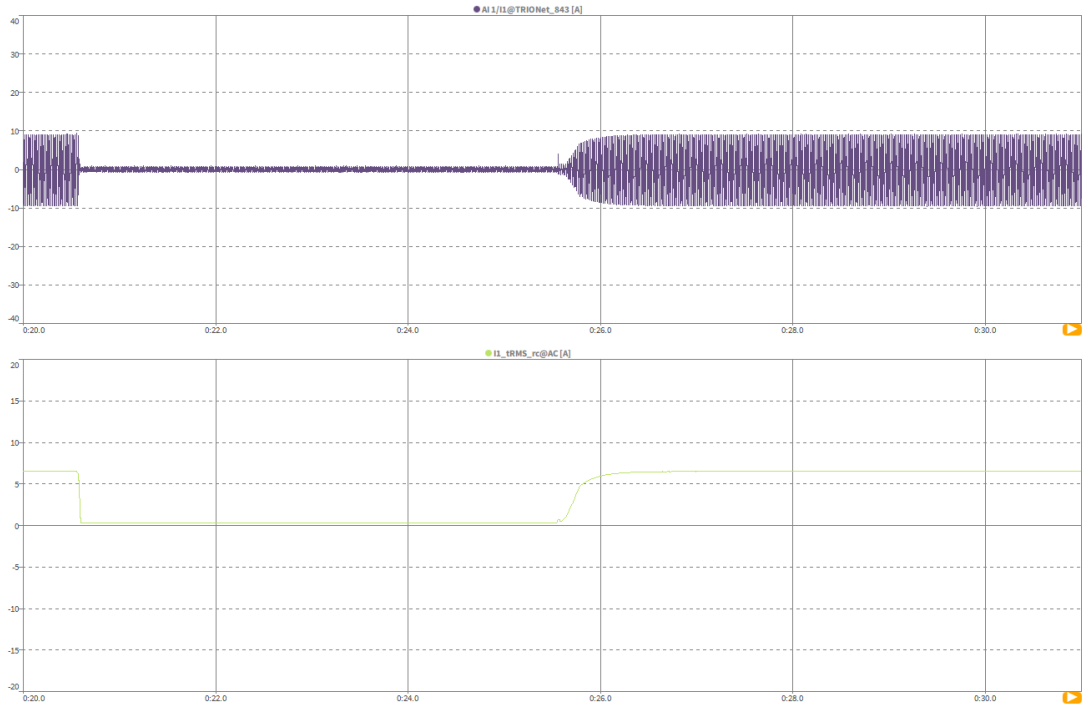
6.1

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6,1
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	9:55:15
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	1,2
	5	Setting dip duration		--	--	5000
	6	Point of fault entry	Total	--	ms	20556
	7	Point of fault clearance	Total	--	ms	25556
	8	Fault duration in empty load test	Total	--	ms	5000
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,207
	10		Total (Phase 2)			1,199
	11		Total (Phase 3)			1,199
	12		Positive sequence			1,197
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,002
	14		Phase 2			0,997
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,997
	17	Active power	Total	t1-10s to t1	p.u.	0,998
	18		Pos.			0,998
	19	Reactive power	Total	t1-10s to t1	p.u.	0,023
	20		Pos.			0,006
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,207
	23		Phase 2			1,199
	24		Phase 3			1,199
	25	Line current	Phase 1	t1+60ms	p.u.	0,051
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,044
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,021
	32		Pos.			0,021
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,997
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,998
	37		Pos.			0,998
	38	Active power rising time	Total	--	s	0,658
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,023
	40		Pos.			0,004
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

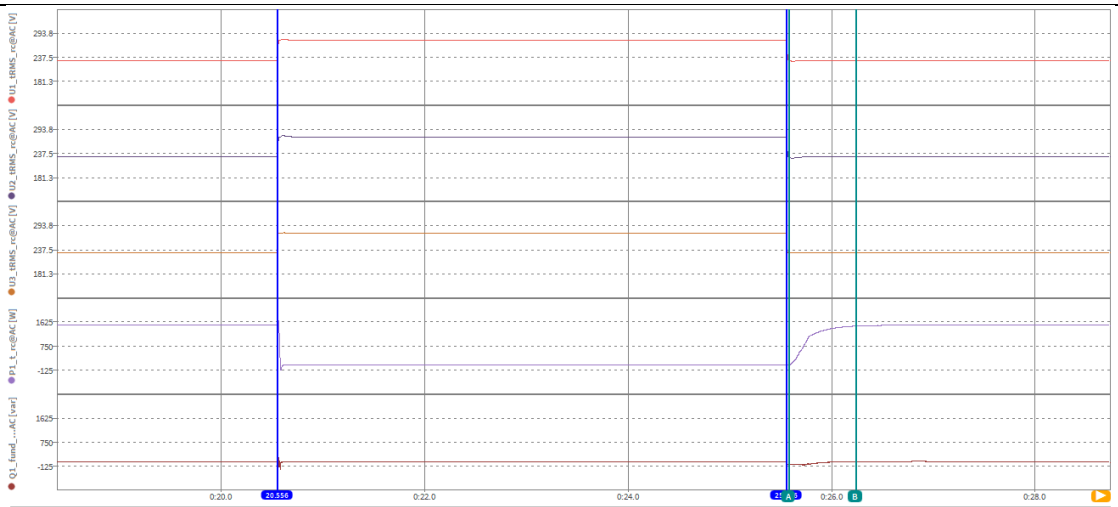
CME06-2BM250



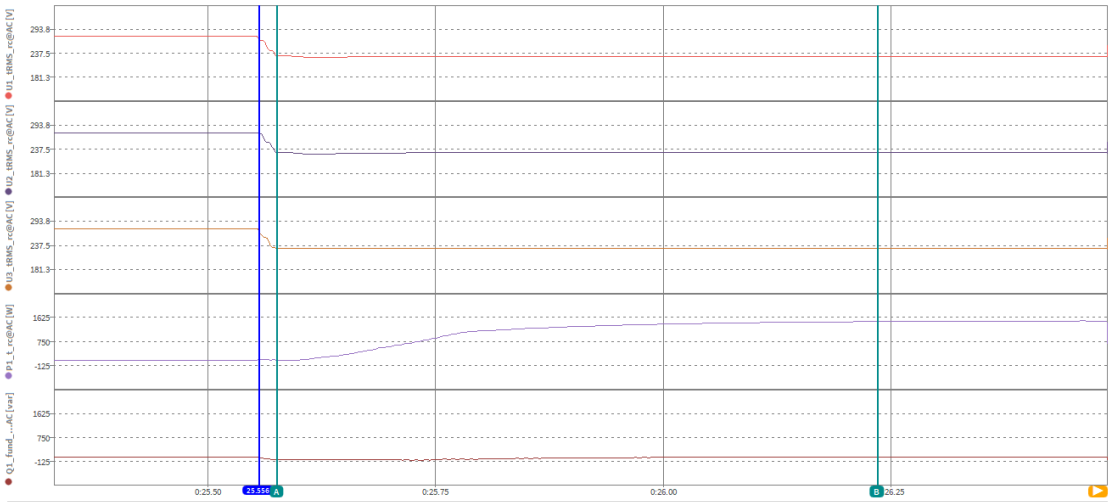


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:25.576648	0:26.235112	0.658464
U1_tRMS_rc@AC [V]	230.5735	230.3452	-0.228333
U2_tRMS_rc@AC [V]	229.9523	229.4187	-0.533569
U3_tRMS_rc@AC [V]	230.1141	229.5943	-0.519791
P1_t_rc@AC [W]	29.55931	1457.378	1427.819
Q1_fund_rc@AC [var]	-93.99066	1.218040	95.20870



	A	B	Delta
Time [s]	0:25.576648	0:26.235112	0.658464
U1_tRMS_rc@AC [V]	230.5735	230.3452	-0.228333
U2_tRMS_rc@AC [V]	229.9523	229.4187	-0.533569
U3_tRMS_rc@AC [V]	230.1141	229.5943	-0.519791
P1_t_rc@AC [W]	29.55931	1457.378	1427.819
Q1_fund_rc@AC [var]	-93.99066	1.218040	95.20870

5.8.3	For PGUs Type 2 and storage systems	P

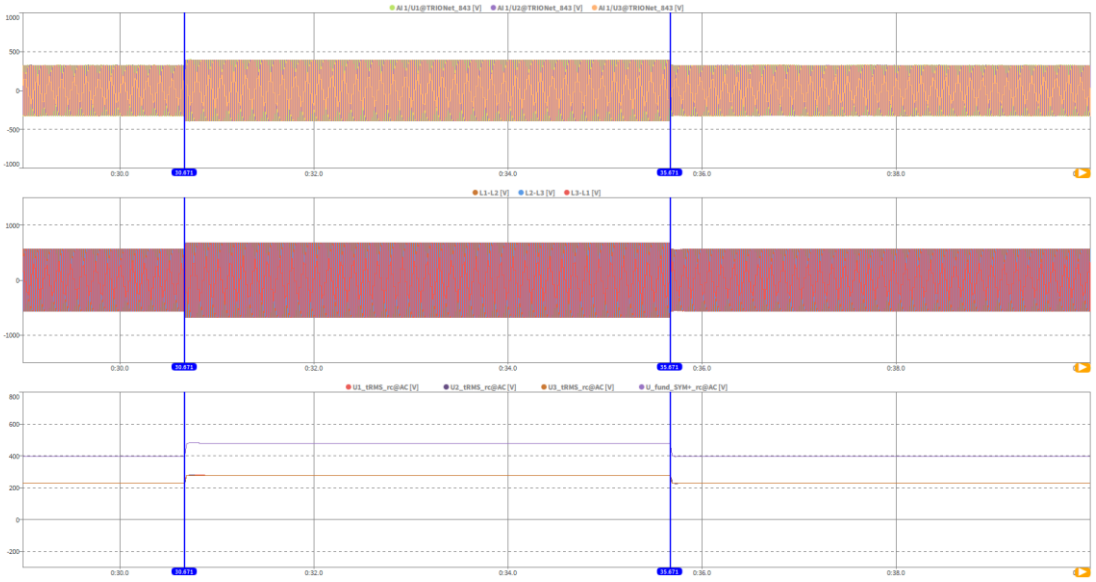
CME06-2BM250

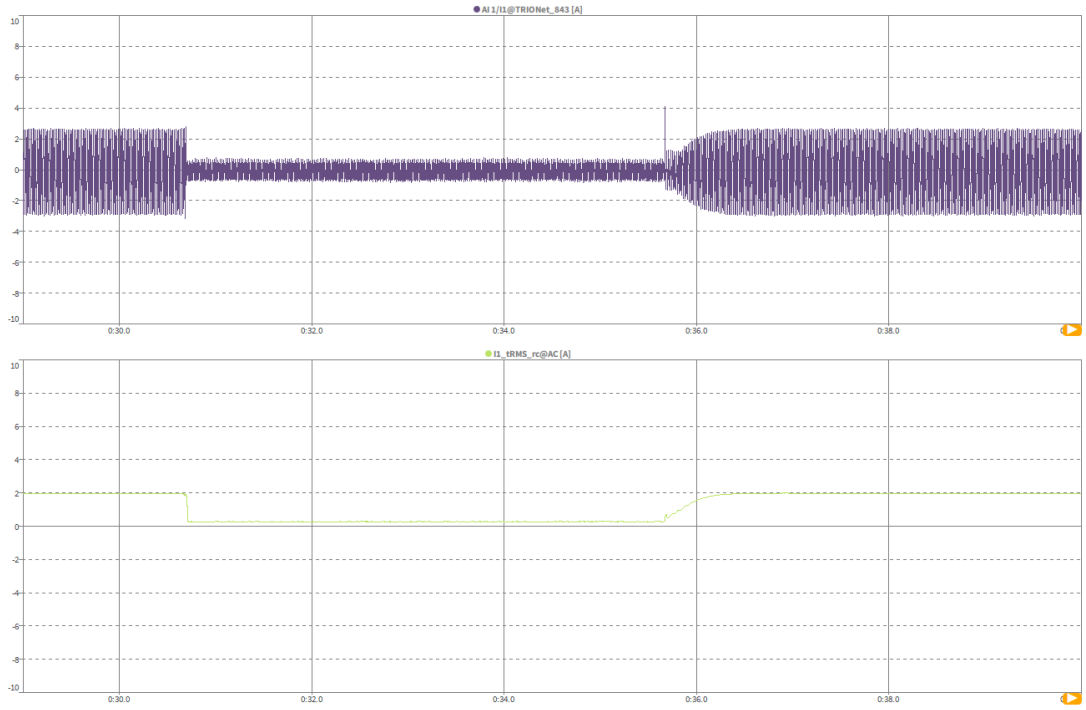
6.2

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6,2
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	10:16:37
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	1,2
	5	Setting dip duration		--	--	5000
	6	Point of fault entry	Total	--	ms	30671
	7	Point of fault clearance	Total	--	ms	35671
	8	Fault duration in empty load test	Total	--	ms	5000
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,207
	10		Total (Phase 2)			1,199
	11		Total (Phase 3)			1,199
	12		Positive sequence			1,197
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,998
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,300
	17	Active power	Total	t1-10s to t1	p.u.	0,298
	18		Pos.			0,298
	19	Reactive power	Total	t1-10s to t1	p.u.	0,033
	20		Pos.			0,007
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,207
	23		Phase 2			1,199
	24		Phase 3			1,199
	25	Line current	Phase 1	t1+60ms	p.u.	0,043
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,041
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,020
	32		Pos.			0,020
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,298
	38	Active power rising time	Total	--	s	0,735
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,033
	40		Pos.			0,007
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250

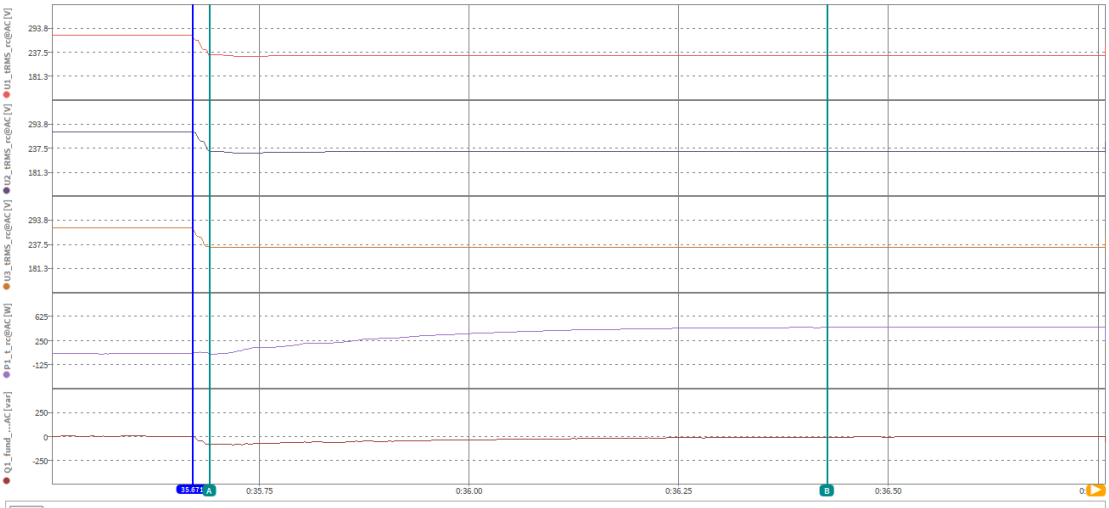




5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250

	A	B	Delta
Time [s]	0:35.691916	0:36.427154	0.735239
U1_tRMS_rc@AC [V]	230.3482	230.1693	-0.178818
U2_tRMS_rc@AC [V]	230.0169	229.4673	-0.549561
U3_tRMS_rc@AC [V]	229.9234	229.6542	-0.269226
P1_t_rc@AC [W]	35.07180	446.2348	411.1630
Q1_fund_rc@AC [var]	-87.32759	-15.45897	71.86863



	A	B	Delta
Time [s]	0:35.691916	0:36.427154	0.735239
U1_tRMS_rc@AC [V]	230.3482	230.1693	-0.178818
U2_tRMS_rc@AC [V]	230.0169	229.4673	-0.549561
U3_tRMS_rc@AC [V]	229.9234	229.6542	-0.269226
P1_t_rc@AC [W]	35.07180	446.2348	411.1630
Q1_fund_rc@AC [var]	-87.32759	-15.45897	71.86863

5.8.3	For PGUs Type 2 and storage systems	P

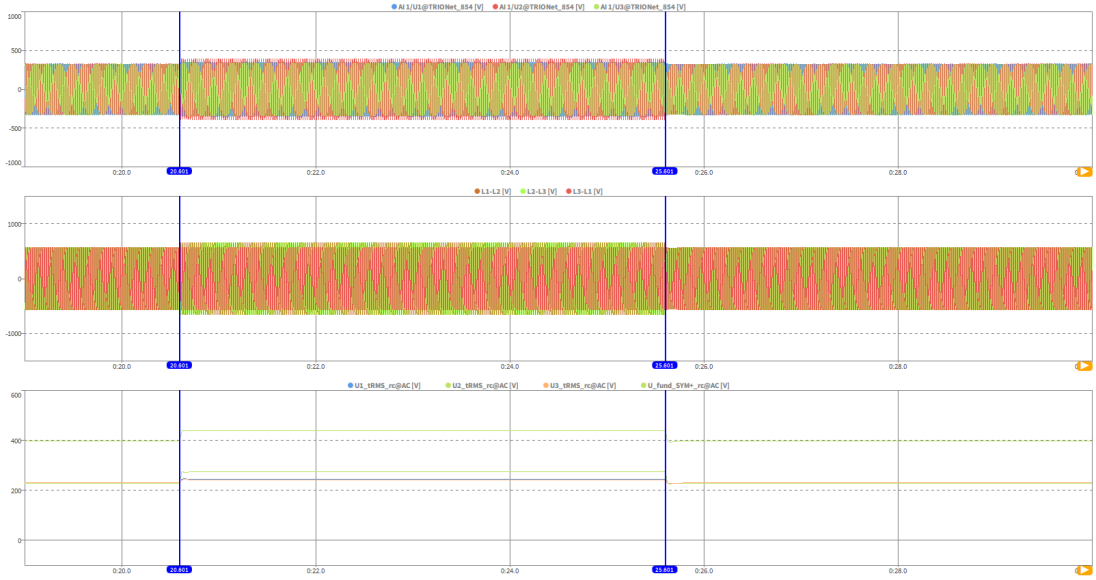
CME06-2BM250

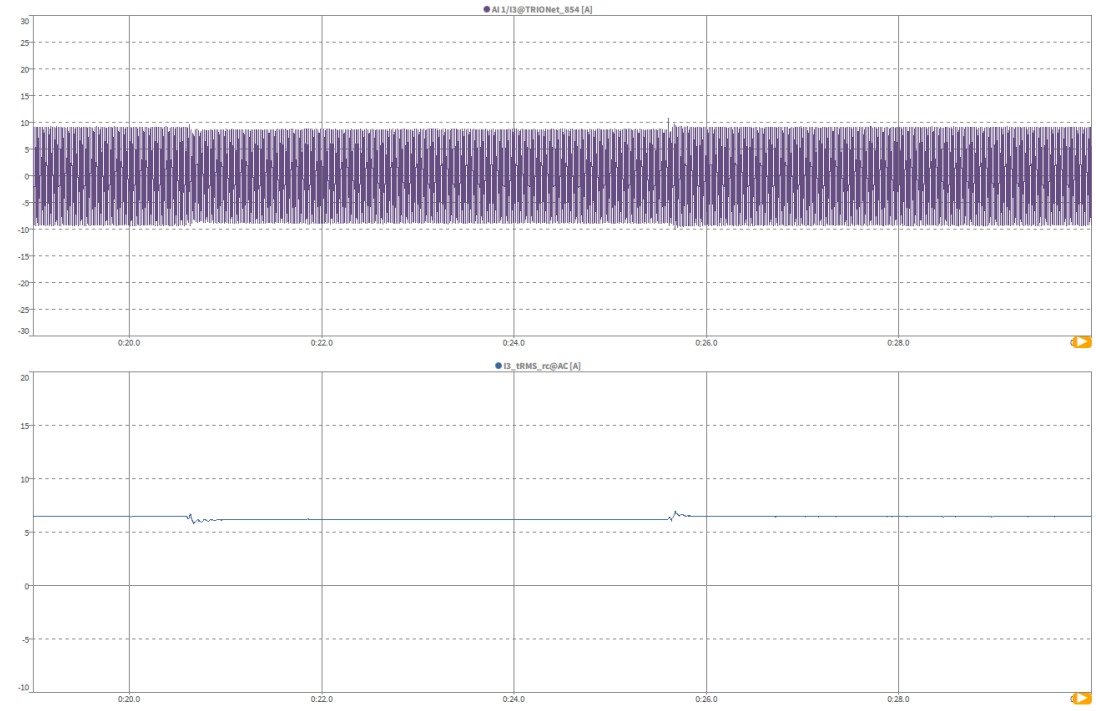
6.3

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6,3
	1	Date	--	--	yyyy.mm.dd	2026/3/19
	2	Time (start of test)	--	--	hh:mm:ss.f	1:34:56
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	1,2
	5	Setting dip duration		--	--	5000
	6	Point of fault entry	Total	--	ms	20601
	7	Point of fault clearance	Total	--	ms	25601
	8	Fault duration in empty load test	Total	--	ms	5000
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,058
	10		Total (Phase 2)			1,198
	11		Total (Phase 3)			1,050
	12		Positive sequence			1,095
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,999
	14		Phase 2			0,997
	15		Phase 3			1,000
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,991
	17	Active power	Total	t1-10s to t1	p.u.	0,990
	18		Pos.			0,990
	19	Reactive power	Total	t1-10s to t1	p.u.	0,033
	20		Pos.			0,002
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,058
	23		Phase 2			1,198
	24		Phase 3			1,050
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,933
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,927
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,992
	32		Pos.			0,992
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,997
	35		Phase 3			1,000
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,989
	37		Pos.			0,989
	38	Active power rising time	Total	--	s	0,136
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,033
	40		Pos.			0,002
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

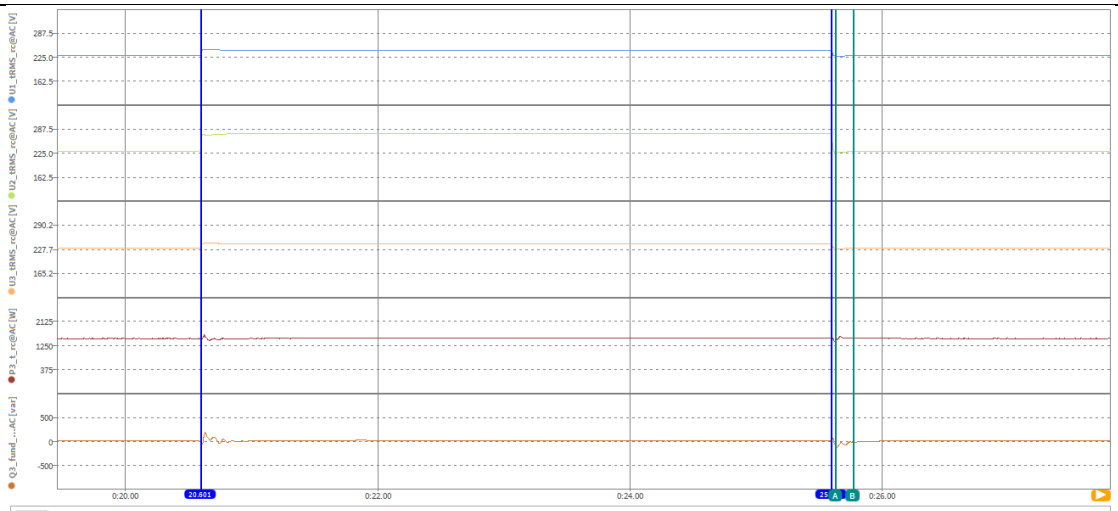
CME06-2BM250



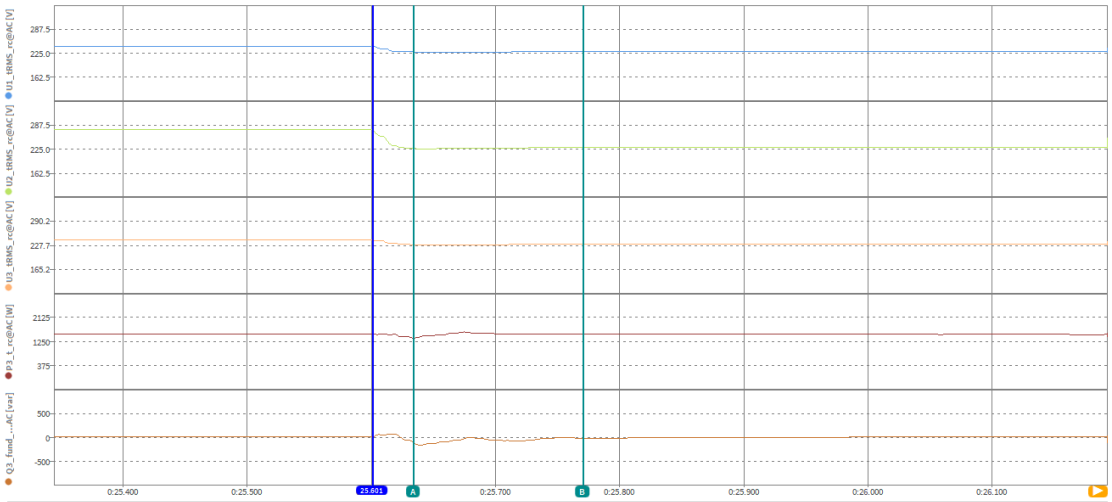


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	0:25.63428	0:25.77059	0.13631
U1_tRMS_rc@AC [V]	228.3898	229.0826	0.692795
U2_tRMS_rc@AC [V]	227.2953	228.7782	1.482910
U3_tRMS_rc@AC [V]	228.6160	229.3785	0.762543
P3_t_rc@AC [W]	1366.043	1500.815	134.7715
Q3_fund_rc@AC [var]	-89.19654	-30.51657	58.67998



	A	B	Delta
Time [s]	0:25.63428	0:25.77059	0.13631
U1_tRMS_rc@AC [V]	228.3898	229.0826	0.692795
U2_tRMS_rc@AC [V]	227.2953	228.7782	1.482910
U3_tRMS_rc@AC [V]	228.6160	229.3785	0.762543
P3_t_rc@AC [W]	1366.043	1500.815	134.7715
Q3_fund_rc@AC [var]	-89.19654	-30.51657	58.67998

5.8.3	For PGUs Type 2 and storage systems	P

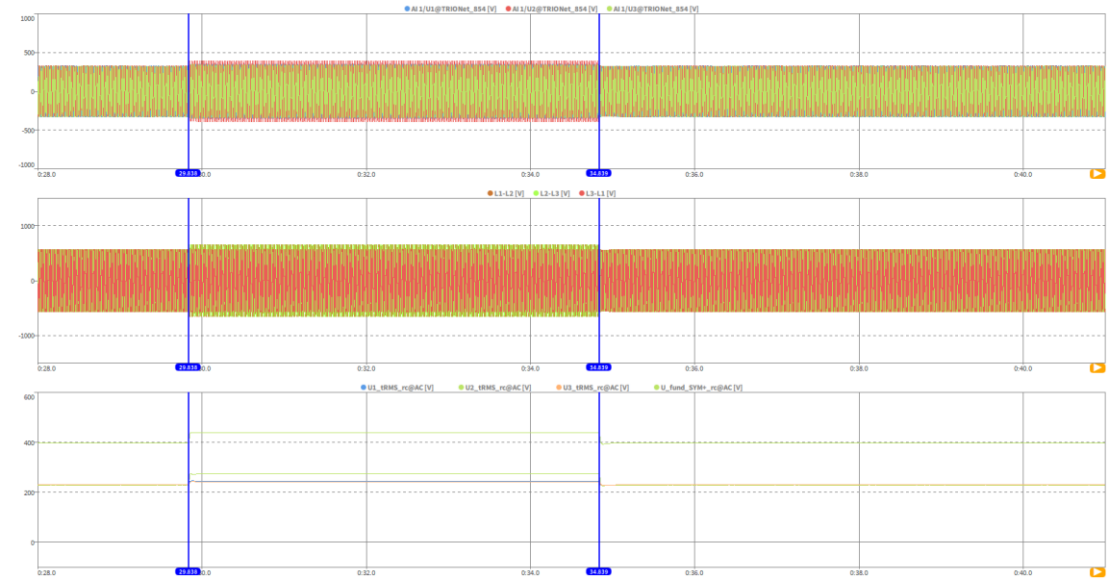
CME06-2BM250

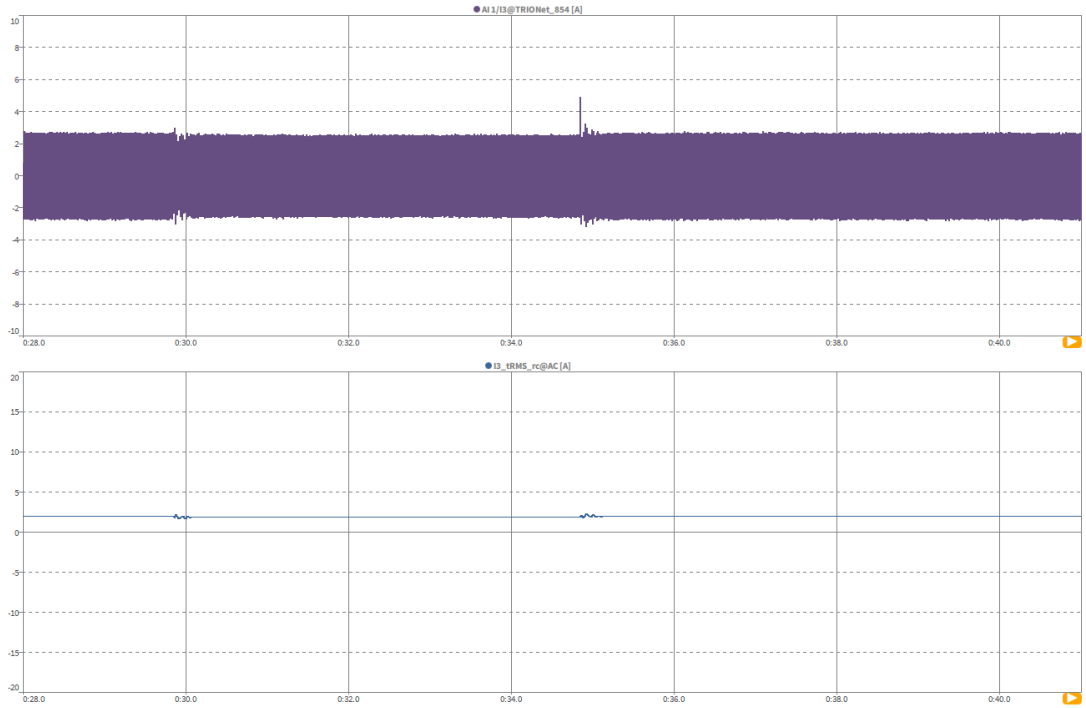
6.4

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6,4
	1	Date	--	--	yyyy.mm.dd	2026/3/19
	2	Time (start of test)	--	--	hh:mm:ss.f	1:33:19
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	1,2
	5	Setting dip duration		--	--	5000
	6	Point of fault entry	Total	--	ms	29838
	7	Point of fault clearance	Total	--	ms	34839
	8	Fault duration in empty load test	Total	--	ms	5001
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,058
	10		Total (Phase 2)			1,199
	11		Total (Phase 3)			1,050
	12		Positive sequence			1,095
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,999
	14		Phase 2			0,998
	15		Phase 3			0,999
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,301
	17	Active power	Total	t1-10s to t1	p.u.	0,298
	18		Pos.			0,298
	19	Reactive power	Total	t1-10s to t1	p.u.	0,048
	20		Pos.			0,012
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,058
	23		Phase 2			1,199
	24		Phase 3			1,049
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,266
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,290
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,298
	32		Pos.			0,298
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,997
	35		Phase 3			0,999
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,298
	38	Active power rising time	Total	--	s	0,249
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,048
	40		Pos.			0,011
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

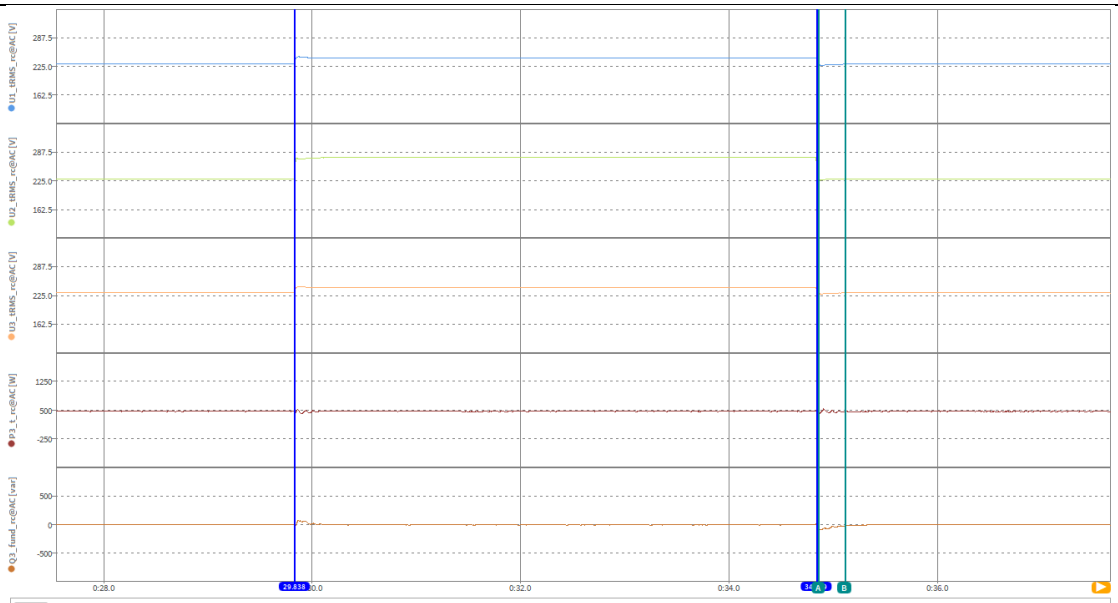
CME06-2BM250



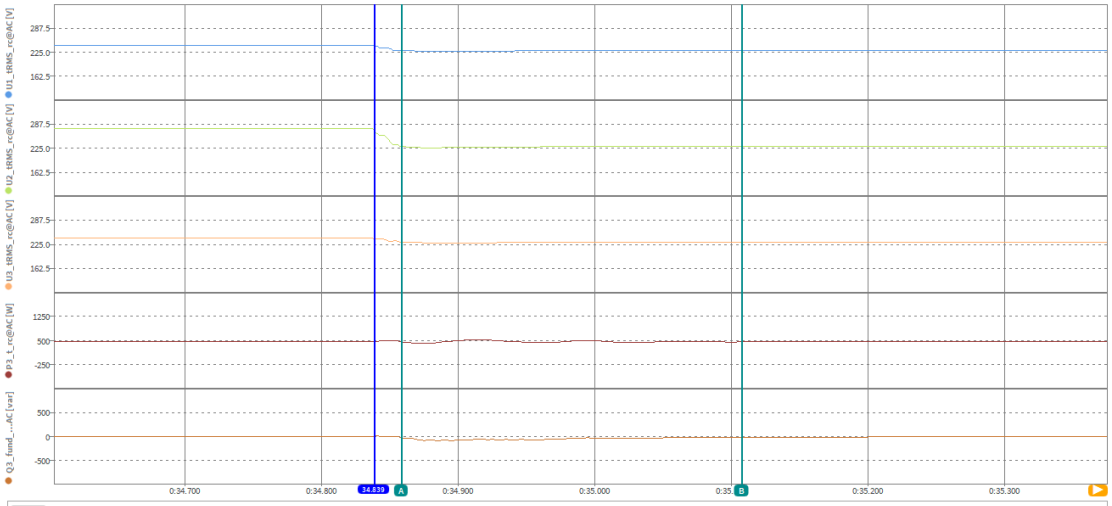


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	间隔
时间 [s]	0:34.858856	0:35.107827	0.248971
U1_tRMS_rc@AC [V]	229.8137	229.6162	-0.197495
U2_tRMS_rc@AC [V]	229.5292	229.3780	-0.151215
U3_tRMS_rc@AC [V]	229.8472	229.7104	-0.136749
P3_t_rc@AC [W]	445.7854	434.7924	-10.99301
Q3_fund_rc@AC [var]	-26.52074	-40.84911	-14.32837



	A	B	Delta
Time [s]	0:34.858856	0:35.107827	0.248971
U1_tRMS_rc@AC [V]	229.8137	229.6162	-0.197495
U2_tRMS_rc@AC [V]	229.5292	229.3780	-0.151215
U3_tRMS_rc@AC [V]	229.8472	229.7104	-0.136749
P3_t_rc@AC [W]	445.7854	434.7924	-10.99301
Q3_fund_rc@AC [var]	-26.52074	-40.84911	-14.32837

5.8.3	For PGUs Type 2 and storage systems	P

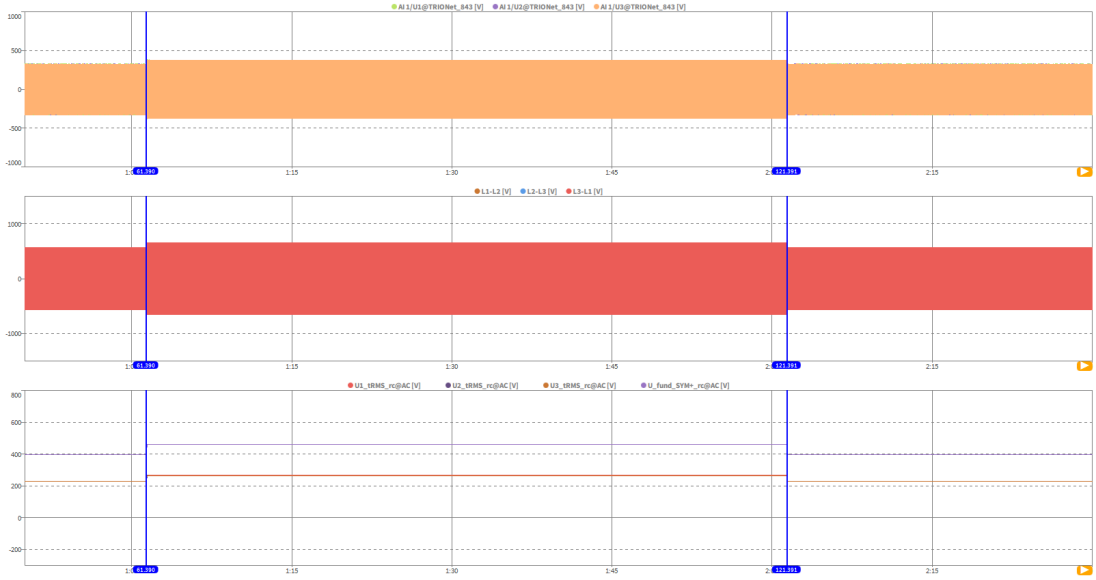
CME06-2BM250

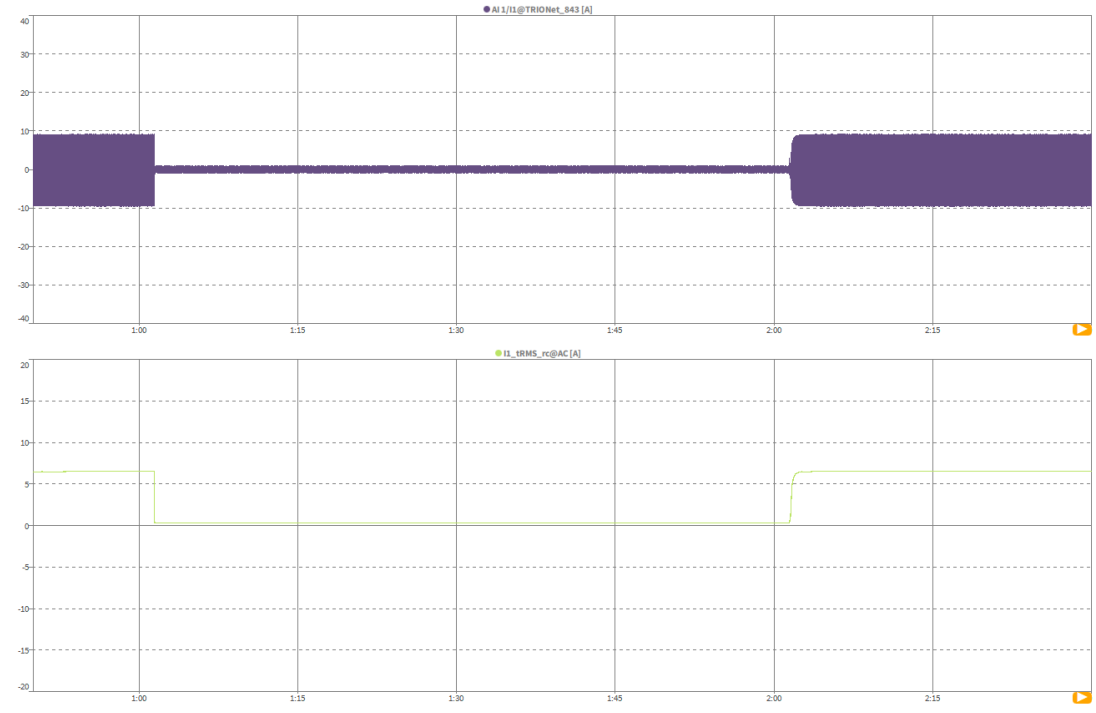
7.1

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7,1
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	10:19:46
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	1,15
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	61390
	7	Point of fault clearance	Total	--	ms	121391
	8	Fault duration in empty load test	Total	--	ms	60001
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,156
	10		Total (Phase 2)			1,148
	11		Total (Phase 3)			1,149
	12		Positive sequence			1,147
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,997
	15		Phase 3			0,998
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,998
	17	Active power	Total	t1-10s to t1	p.u.	0,999
	18		Pos.			0,999
	19	Reactive power	Total	t1-10s to t1	p.u.	0,025
	20		Pos.			0,004
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,156
	23		Phase 2			1,148
	24		Phase 3			1,149
	25	Line current	Phase 1	t1+60ms	p.u.	0,072
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,046
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,021
	32		Pos.			0,021
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,002
	34		Phase 2			0,997
	35		Phase 3			0,998
	36	Active power	Total	t2+3s to t2+10s	p.u.	1,001
	37		Pos.			1,001
	38	Active power rising time	Total	--	s	0,708
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,025
	40		Pos.			0,004
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

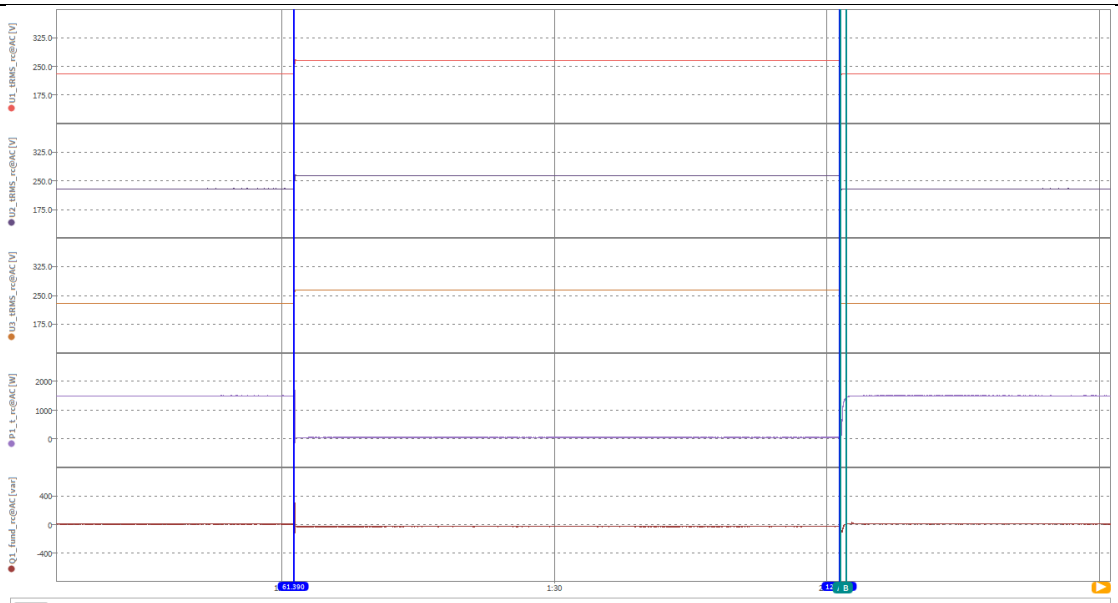
CME06-2BM250



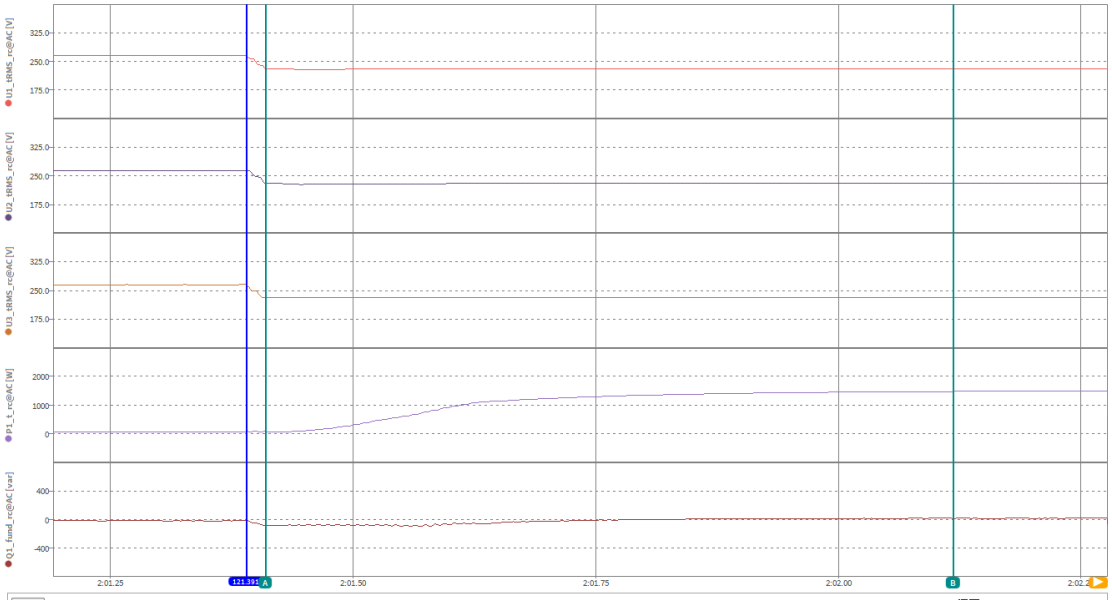


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	间隔
时间 [s]	2:01.41037	2:02.11858	0.70821
U1_tRMS_rc@AC [V]	232.7327	230.3710	-2.361649
U2_tRMS_rc@AC [V]	230.6874	229.4140	-1.273453
U3_tRMS_rc@AC [V]	230.1901	229.5655	-0.624649
P1_t_rc@AC [W]	48.26743	1455.170	1406.902
Q1_fund_rc@AC [var]	-87.96790	6.342082	94.30998



	A	B	间隔
时间 [s]	2:01.41037	2:02.11858	0.70821
U1_tRMS_rc@AC [V]	232.7327	230.3710	-2.361649
U2_tRMS_rc@AC [V]	230.6874	229.4140	-1.273453
U3_tRMS_rc@AC [V]	230.1901	229.5655	-0.624649
P1_t_rc@AC [W]	48.26743	1455.170	1406.902
Q1_fund_rc@AC [var]	-87.96790	6.342082	94.30998

5.8.3	For PGUs Type 2 and storage systems	P

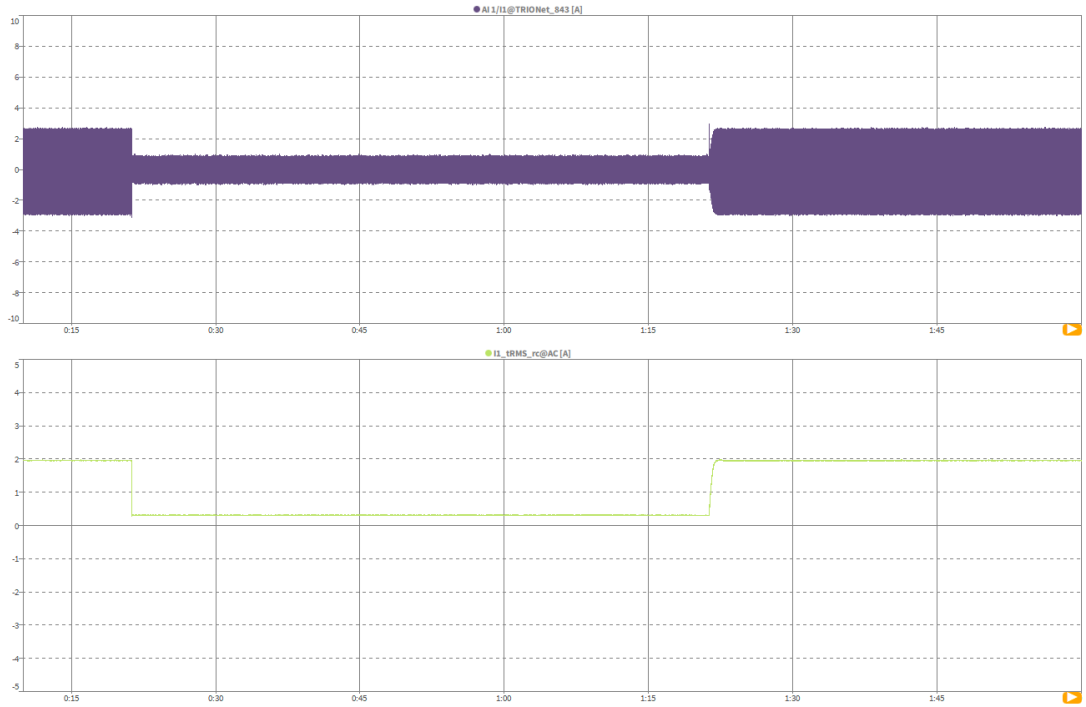
CME06-2BM250

7.2

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7,2
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	10:12:53
	3	Fault type (phase)	--	--	--	A
	4	Setting voltage depth	Line to line	--	p.u.	1,15
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	21243
	7	Point of fault clearance	Total	--	ms	81243
	8	Fault duration in empty load test	Total	--	ms	60000
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,157
	10		Total (Phase 2)			1,148
	11		Total (Phase 3)			1,149
	12		Positive sequence			1,147
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	1,001
	14		Phase 2			0,998
	15		Phase 3			0,999
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,300
	17	Active power	Total	t1-10s to t1	p.u.	0,299
	18		Pos.			0,299
	19	Reactive power	Total	t1-10s to t1	p.u.	0,033
	20		Pos.			0,007
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,157
	23		Phase 2			1,148
	24		Phase 3			1,149
	25	Line current	Phase 1	t1+60ms	p.u.	0,046
	26		Phase 2			--
	27		Phase 3			--
	28	Line current	Phase 1	t1+100ms	p.u.	0,047
	29		Phase 2			--
	30		Phase 3			--
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,022
	32		Pos.			0,022
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	1,001
	34		Phase 2			0,998
	35		Phase 3			0,999
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,300
	38	Active power rising time	Total	--	s	0,648
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,033
	40		Pos.			0,007
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

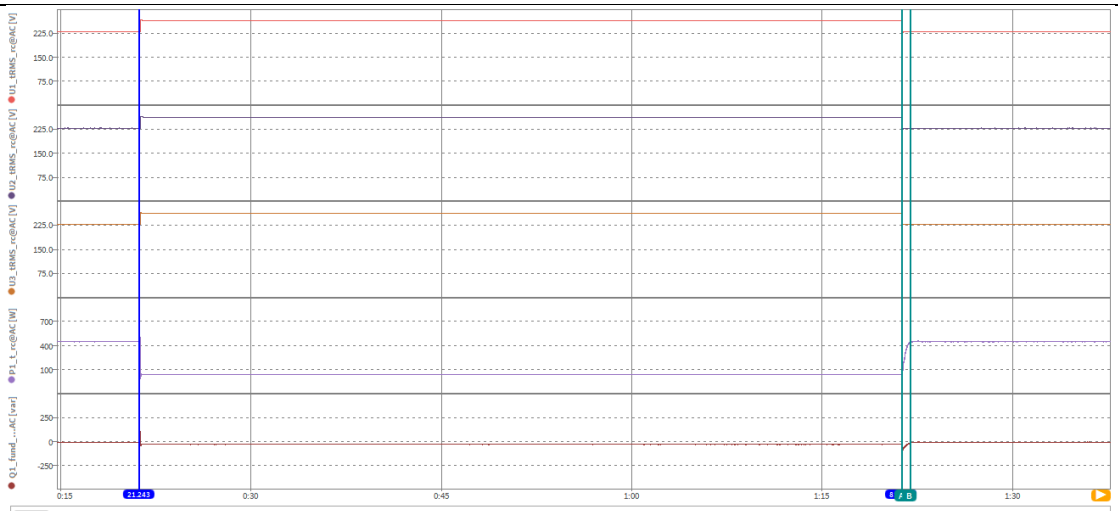
5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250

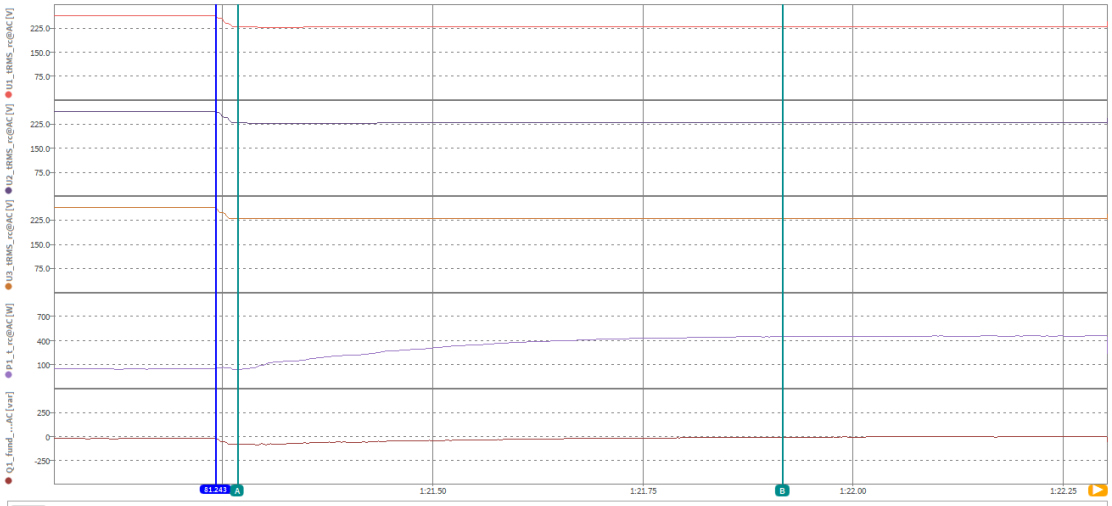


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	1:21.268482	1:21.916596	0.648114
U1_tRMS_rc@AC [V]	230.4767	230.1684	-0.308365
U2_tRMS_rc@AC [V]	229.8511	229.5012	-0.349899
U3_tRMS_rc@AC [V]	230.0615	229.6651	-0.396469
P1_t_rc@AC [W]	28.03199	442.4459	414.4139
Q1_fund_rc@AC [var]	-92.66280	-16.56269	76.10011



	A	B	Delta
Time [s]	1:21.268482	1:21.916596	0.648114
U1_tRMS_rc@AC [V]	230.4767	230.1684	-0.308365
U2_tRMS_rc@AC [V]	229.8511	229.5012	-0.349899
U3_tRMS_rc@AC [V]	230.0615	229.6651	-0.396469
P1_t_rc@AC [W]	28.03199	442.4459	414.4139
Q1_fund_rc@AC [var]	-92.66280	-16.56269	76.10011

5.8.3	For PGUs Type 2 and storage systems	P

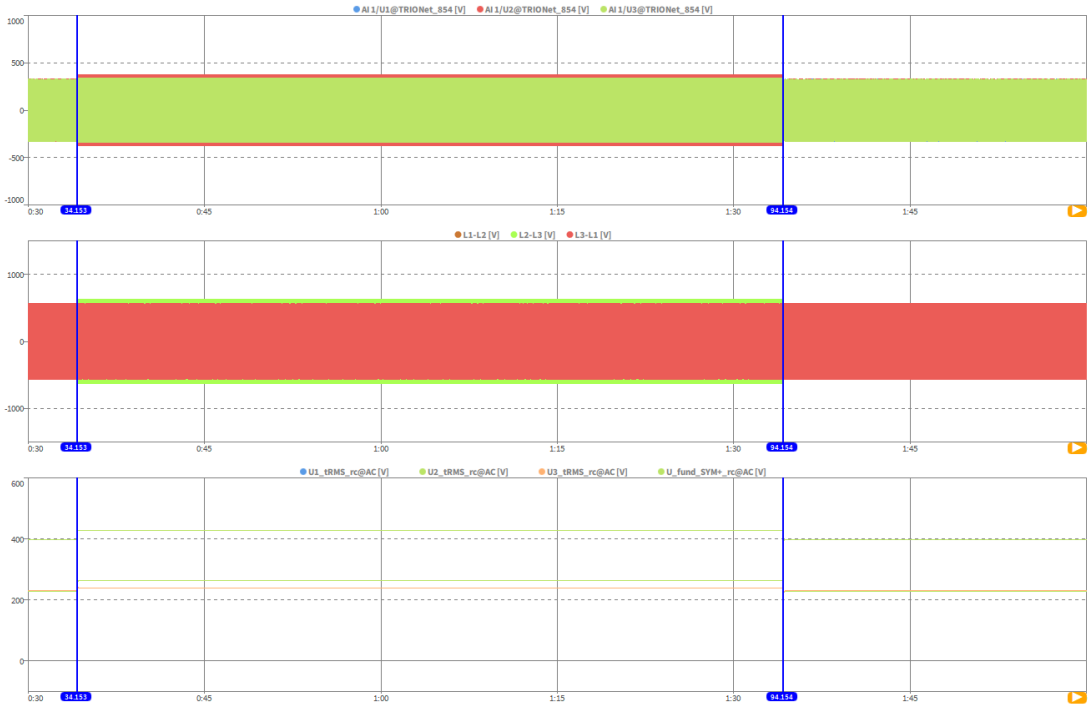
CME06-2BM250

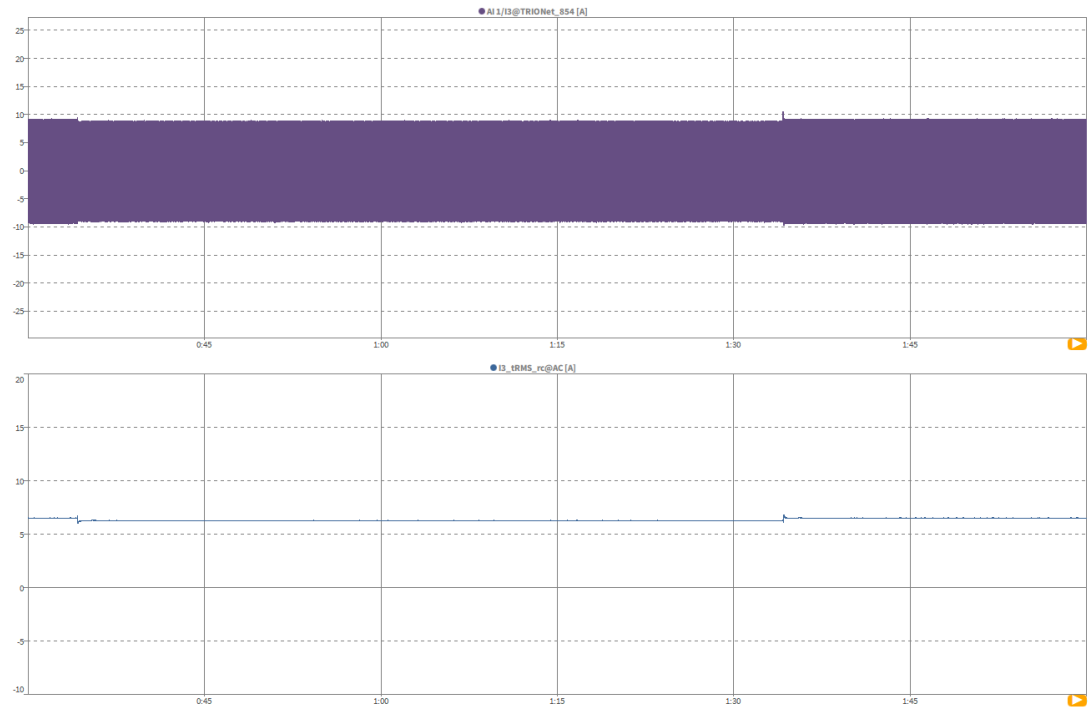
7.3

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7,3
	1	Date	--	--	yyyy.mm.dd	2026/3/19
	2	Time (start of test)	--	--	hh:mm:ss.f	1:39:24
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	1,15
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	34153
	7	Point of fault clearance	Total	--	ms	94154
	8	Fault duration in empty load test	Total	--	ms	60001
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,038
	10		Total (Phase 2)			1,148
	11		Total (Phase 3)			1,040
	12		Positive sequence			1,069
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,999
	14		Phase 2			0,998
	15		Phase 3			1,000
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	1,000
	17	Active power	Total	t1-10s to t1	p.u.	0,997
	18		Pos.			0,997
	19	Reactive power	Total	t1-10s to t1	p.u.	0,034
	20		Pos.			0,006
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,042
	23		Phase 2			1,148
	24		Phase 3			1,042
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,943
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,947
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,999
	32		Pos.			0,999
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,997
	35		Phase 3			1,000
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,997
	37		Pos.			0,997
	38	Active power rising time	Total	--	s	0,405
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,033
	40		Pos.			0,002
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

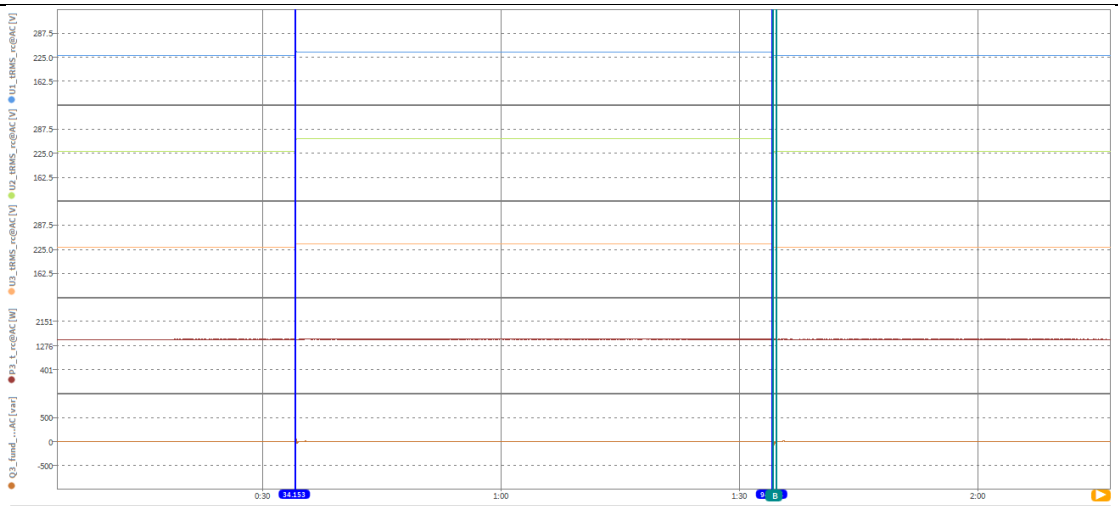
CME06-2BM250



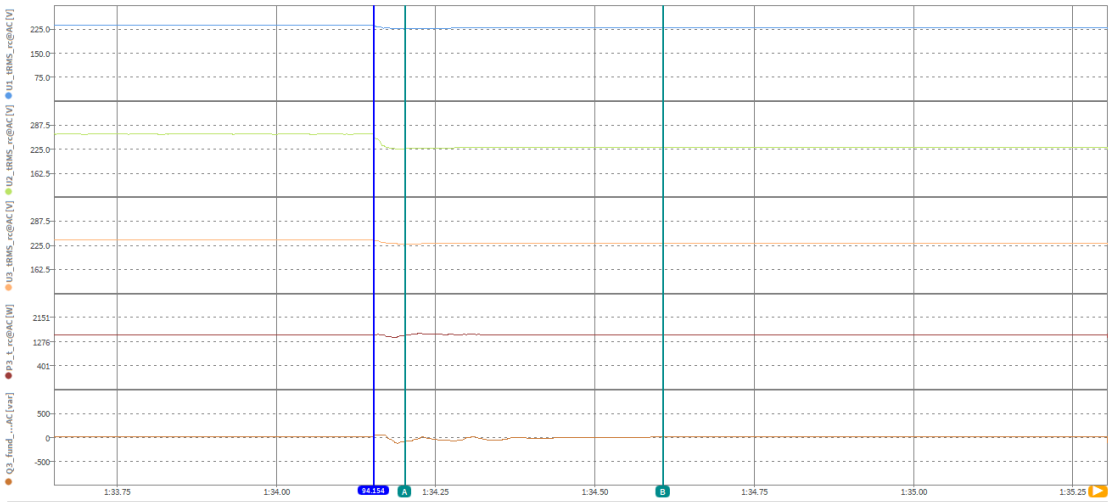


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	1:34.20258	1:34.60758	0.40501
U1_tRMS_rc@AC [V]	227.9279	229.6983	1.770386
U2_tRMS_rc@AC [V]	225.9124	229.3522	3.439728
U3_tRMS_rc@AC [V]	228.0167	229.9169	1.900192
P3_t_rc@AC [W]	1460.247	1495.577	35.32959
Q3_fund_rc@AC [var]	-111.7052	-5.981074	105.7241



	A	B	Delta
Time [s]	1:34.20258	1:34.60758	0.40501
U1_tRMS_rc@AC [V]	227.9279	229.6983	1.770386
U2_tRMS_rc@AC [V]	225.9124	229.3522	3.439728
U3_tRMS_rc@AC [V]	228.0167	229.9169	1.900192
P3_t_rc@AC [W]	1460.247	1495.577	35.32959
Q3_fund_rc@AC [var]	-111.7052	-5.981074	105.7241

5.8.3	For PGUs Type 2 and storage systems	P

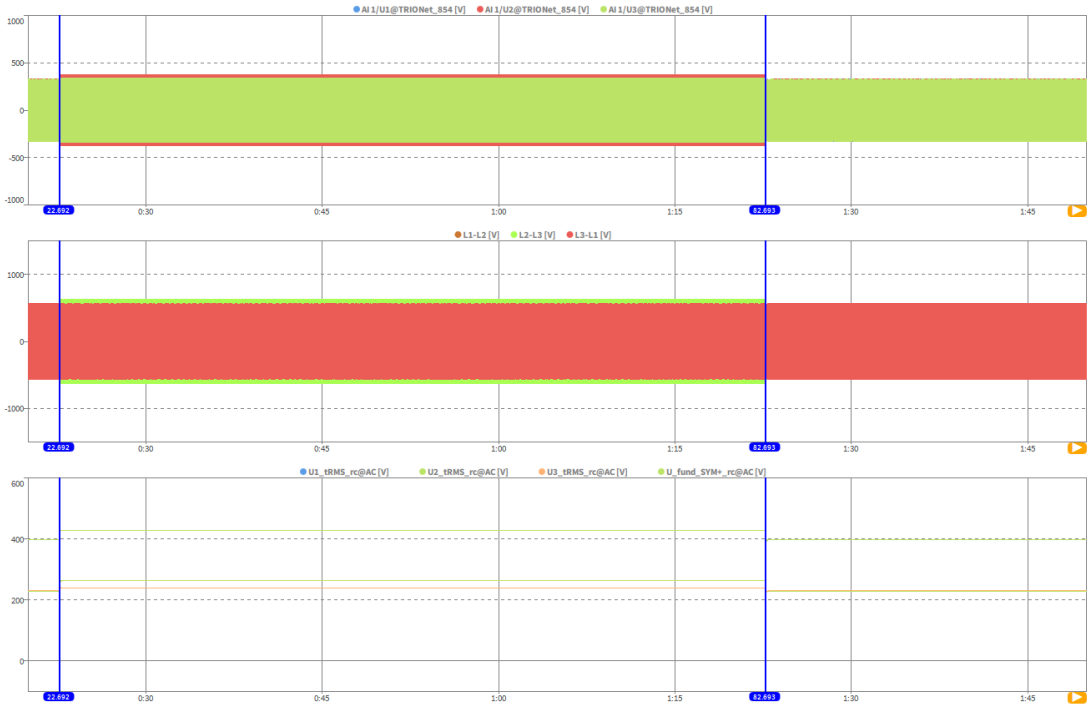
CME06-2BM250

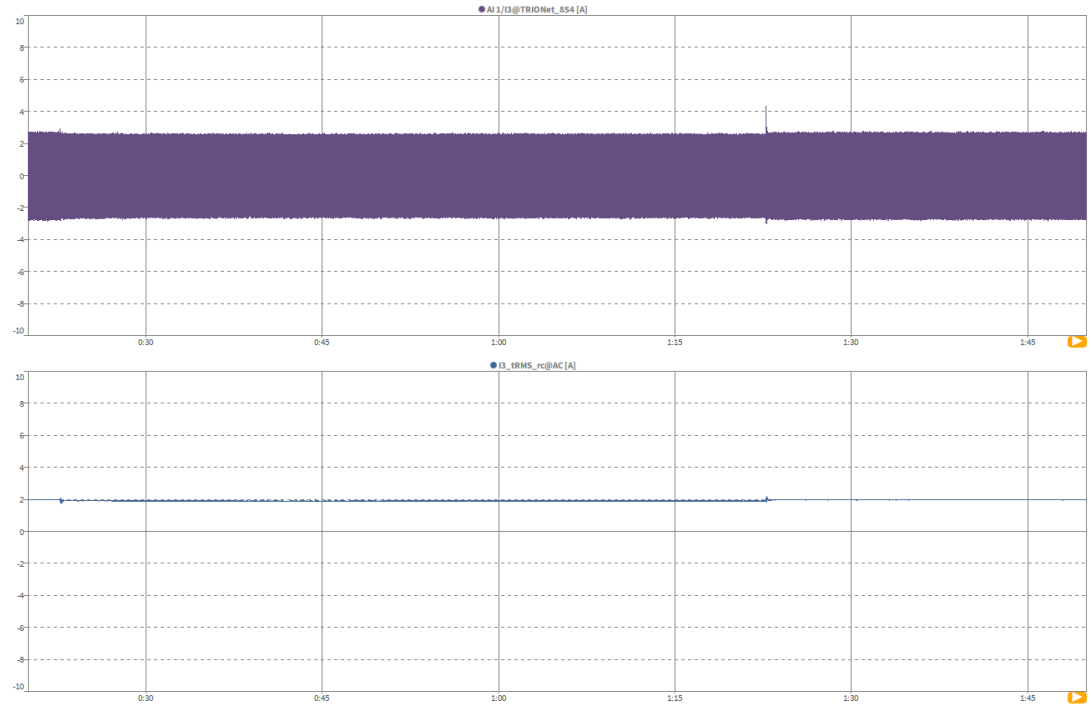
7.4

Condition						Measured value
Item	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7,4
	1	Date	--	--	yyyy.mm.dd	2026/2/11
	2	Time (start of test)	--	--	hh:mm:ss.f	11:24:33
	3	Fault type (phase)	--	--	--	D1
	4	Setting voltage depth	Line to line	--	p.u.	1,15
	5	Setting dip duration		--	--	60000
	6	Point of fault entry	Total	--	ms	22692
	7	Point of fault clearance	Total	--	ms	82693
	8	Fault duration in empty load test	Total	--	ms	60001
	9	Voltage depth/height in empty load test	Total (Phase 1)	t1+100ms to t2 and t1-10s to t1	p.u.	1,038
	10		Total (Phase 2)			1,148
	11		Total (Phase 3)			1,039
	12		Positive sequence			1,069
Before dip <t1	13	Voltage	Phase 1	t1-10s to t1	p.u.	0,999
	14		Phase 2			0,999
	15		Phase 3			0,999
	16	Current	Pos.	t1-500ms to t1-100ms	p.u.	0,302
	17	Active power	Total	t1-10s to t1	p.u.	0,301
	18		Pos.			0,301
	19	Reactive power	Total	t1-10s to t1	p.u.	0,048
	20		Pos.			0,012
	21	Cosφ	Total	t1-10s to t1	--	0,999
During dip t1 to t2	22	Voltage	Phase 1	t1+100ms to t2-20ms	p.u.	1,038
	23		Phase 2			1,148
	24		Phase 3			1,039
	25	Line current	Phase 1	t1+60ms	p.u.	--
	26		Phase 2			--
	27		Phase 3			0,273
	28	Line current	Phase 1	t1+100ms	p.u.	--
	29		Phase 2			--
	30		Phase 3			0,293
	31	Active power	Total	t1+100ms to t2-20ms	p.u.	0,298
	32		Pos.			0,299
After dip > t2	33	Voltage	Phase 1	t2+3s to t2+10s	p.u.	0,999
	34		Phase 2			0,997
	35		Phase 3			0,999
	36	Active power	Total	t2+3s to t2+10s	p.u.	0,298
	37		Pos.			0,298
	38	Active power rising time	Total	--	s	0,143
	39	Reactive power	Total	t2+3s to t2+10s	p.u.	0,048
	40		Pos.			0,011
	41	Reactive power rising time	total	--	s	--
	42	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	Yes

5.8.3	For PGUs Type 2 and storage systems	P

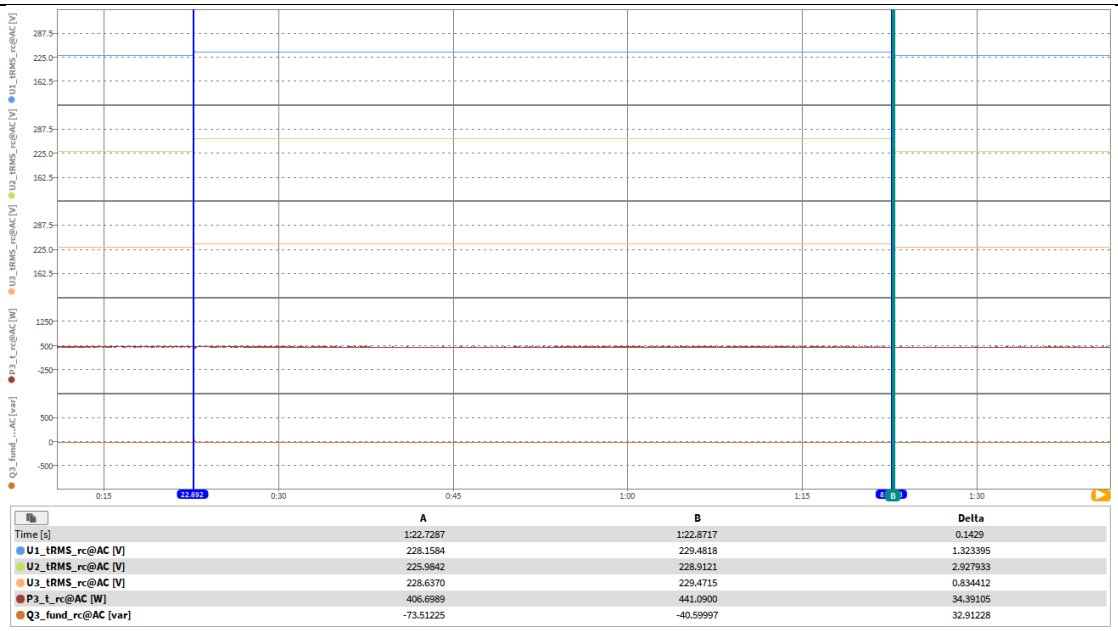
CME06-2BM250



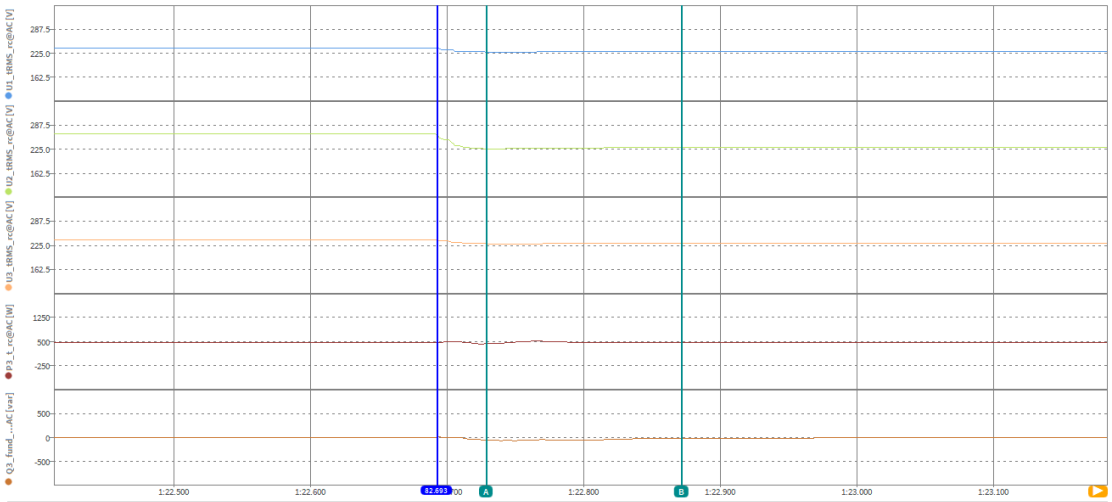


5.8.3	For PGUs Type 2 and storage systems	P

CME06-2BM250



	A	B	Delta
Time [s]	1:22.7287	1:22.8717	0.1429
U1_tRMS_rc@AC [V]	228.1584	229.4818	1.323395
U2_tRMS_rc@AC [V]	225.9842	228.9121	2.927933
U3_tRMS_rc@AC [V]	228.6370	229.4715	0.834412
P3_t_rc@AC [W]	406.6989	441.0900	34.39105
Q3_fund_rc@AC [var]	-73.51225	-40.59997	32.91228



	A	B	Delta
Time [s]	1:22.7287	1:22.8717	0.1429
U1_tRMS_rc@AC [V]	228.1584	229.4818	1.323395
U2_tRMS_rc@AC [V]	225.9842	228.9121	2.927933
U3_tRMS_rc@AC [V]	228.6370	229.4715	0.834412
P3_t_rc@AC [W]	406.6989	441.0900	34.39105
Q3_fund_rc@AC [var]	-73.51225	-40.59997	32.91228

Annex 2 – Pictures of the unit

Photos of EUT

Enclosure front view

Enclosure Side view-1

Photos of EUT

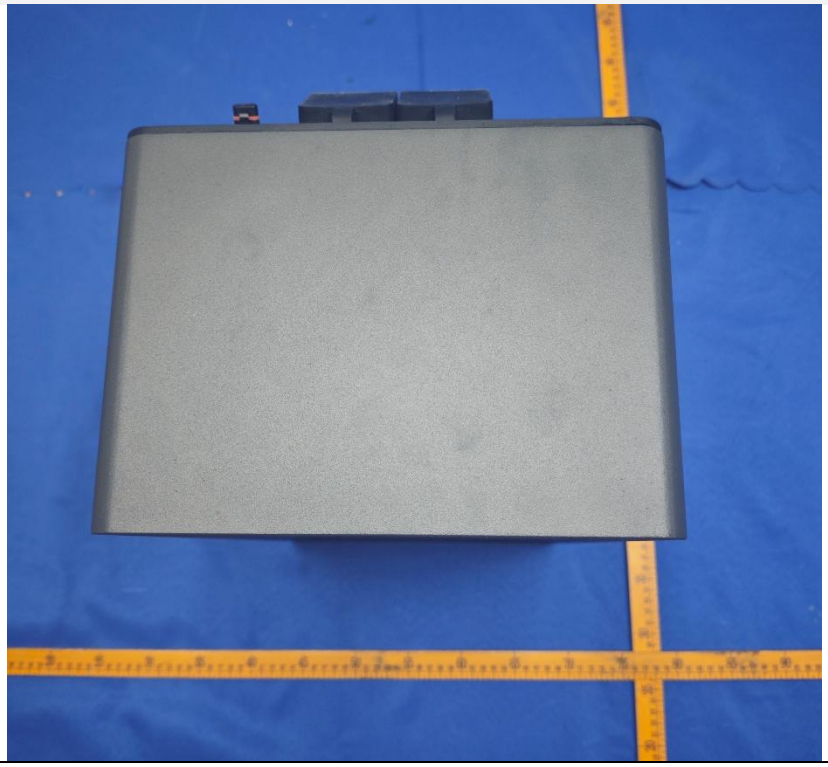
Enclosure Side view-2

Enclosure rear view

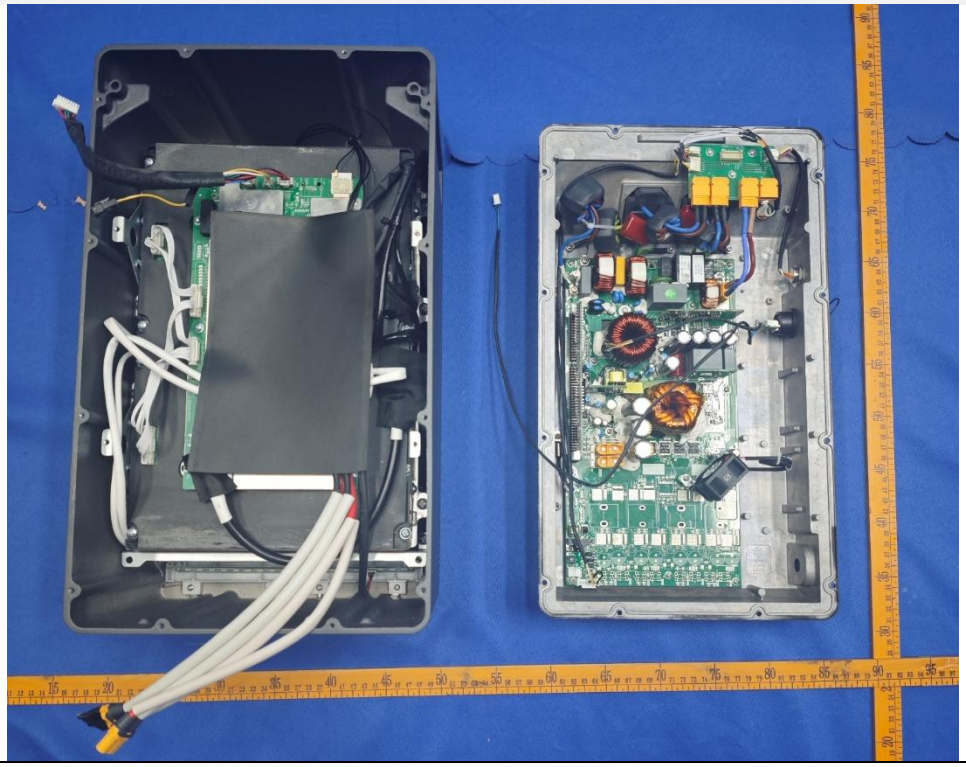
Photos of EUT

Enclosure bottom view

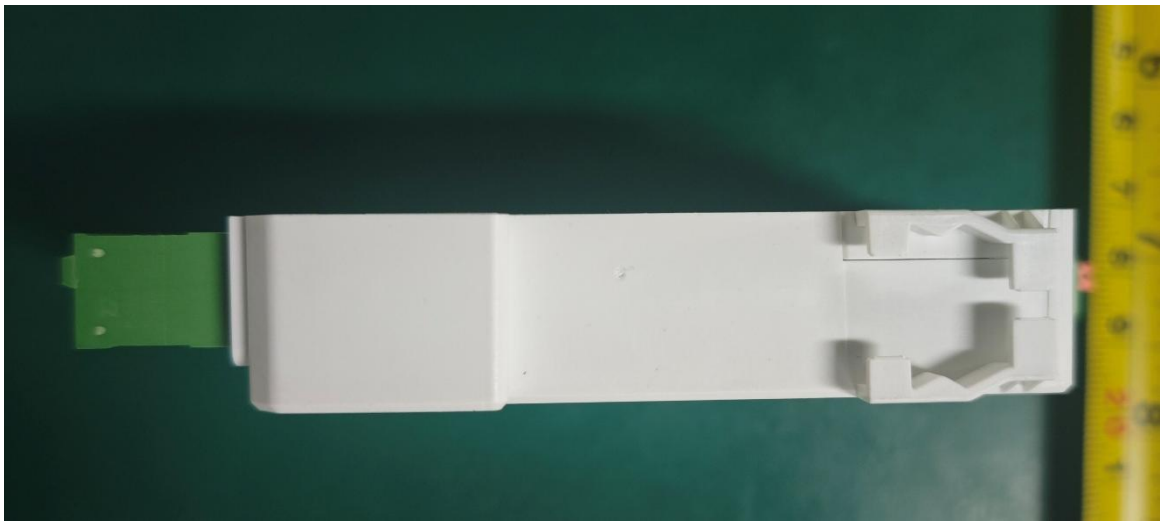
Enclosure TOP view



Photos of EUT
Enclosure internal view-1

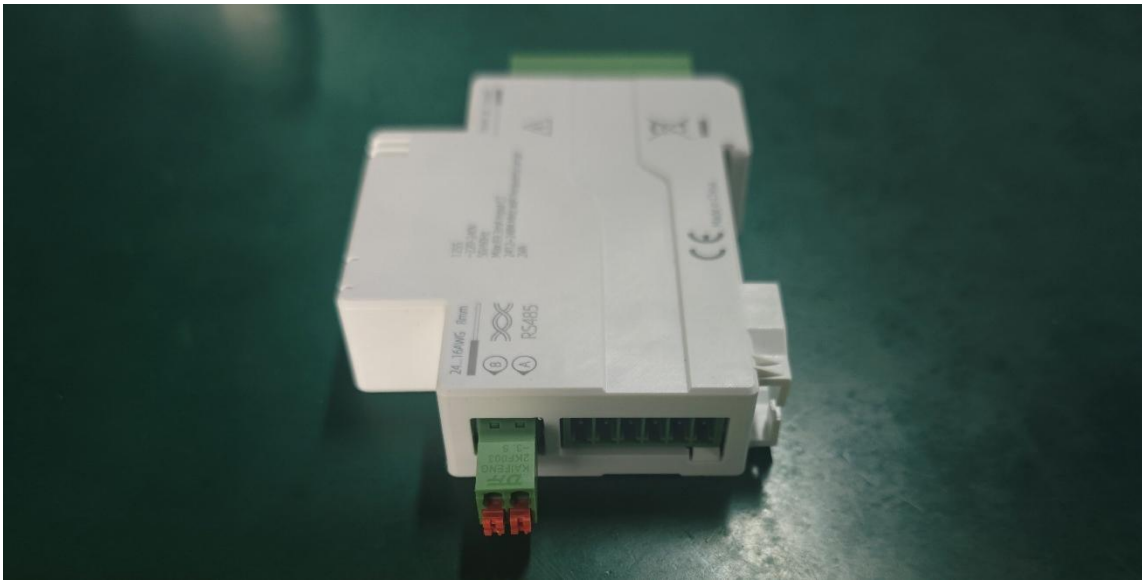
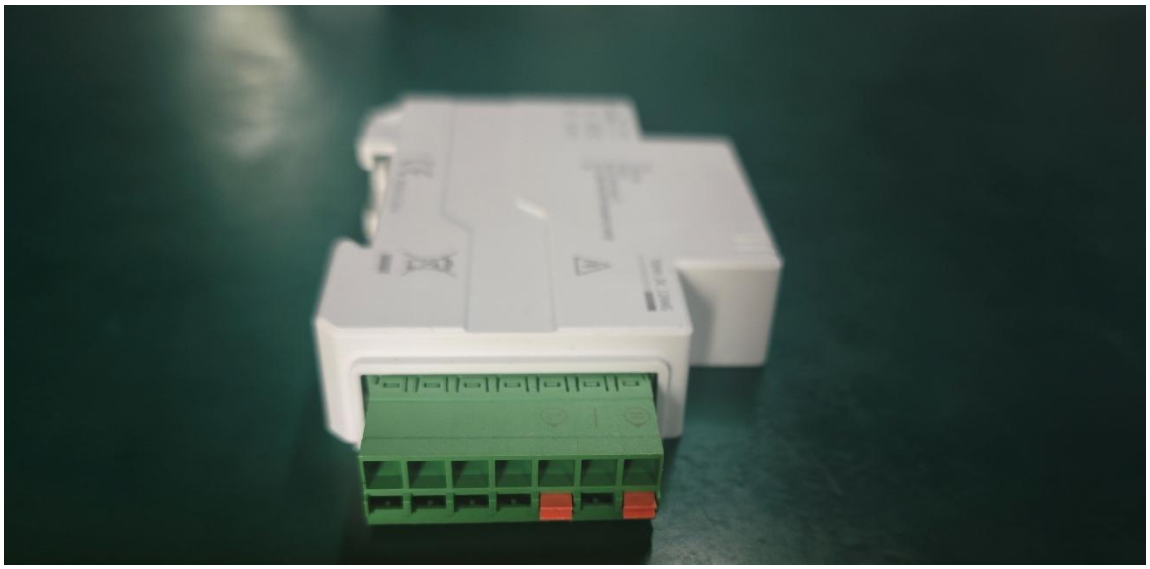


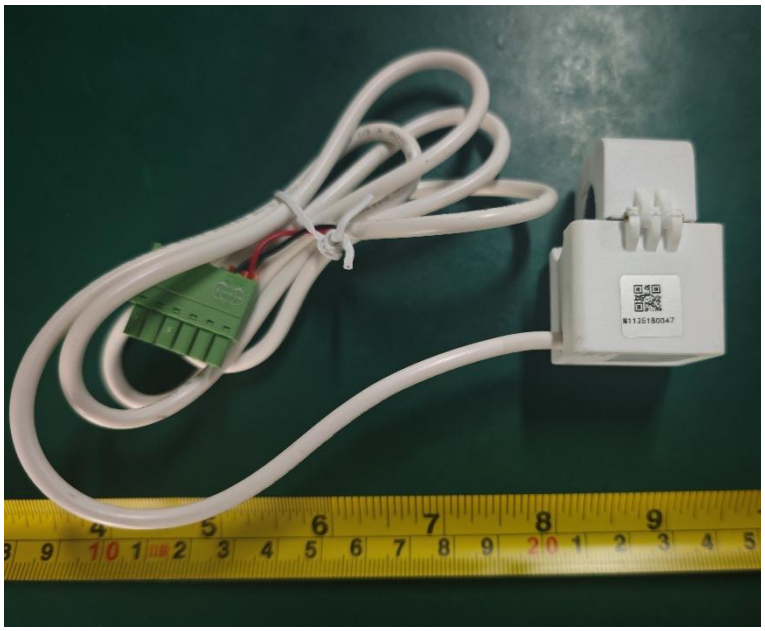
Photos of Meter
Enclosure view-1

Enclosure view-2


Enclosure view-3

Enclosure view-4


Enclosure view-5

Enclosure view-6


Photos of Current Transformer
Enclosure view-1

Enclosure view-2


Annex 3 – Test equipment list

Date(s) of performance of tests:		2025-12-25 to 2026-04-03			
Equipment	**Internal No.**	**Manufacturer**	**Type**	**Serial No.**	**Next Calibration**
AC source	HC-ENG-038	KEWELL	KAC-45-345-33	6018888220903208	Monitored by Power Analyzer
RLC Load	HC-ENG-005	Qunling Energy Resources	ACLT-3803H	93H006289	
Data acquisition instrument	HC-ENG-045	DEWETRON	TRION-1820-POWER	A1221033/C5220852	2027-03-18
Current sensor	HC-ENG-045-001	SIGNALTEC	CT 400	1220490451	2027-03-18
	HC-ENG-045-002	SIGNALTEC	CT 400	1220490452	2027-03-18
	HC-ENG-045-003	SIGNALTEC	CT 400	1220490453	2027-03-18
	HC-ENG-045-004	SIGNALTEC	CT 400	1220490454	2027-03-18
Digital phosphor Oscilloscope	---	Tektronix	MDO3014	---	2026-08-28

---End of test report--